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U.S. Department
of Transportation
National Highway
Traffic Safety
Administration

Preliminary Breath Testing for Drinking-Driving Enforcement

Instructor's Manual

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Preliminary Breath Testing for Drinking-Driving Enforcement

Instructor's Manual

U.S. Department
of Transportation

**National Highway
Traffic Safety
Administration**

Foreword

The National Highway Traffic Safety Administration (NHTSA) has responsibility for the development of training programs responsive to the Uniform National Standards established by the Highway Safety Act of 1966. These programs are designed to provide guidelines for training in State and local jurisdictions having highway safety and traffic law enforcement responsibilities. NHTSA therefore intends that they be of the highest quality and that they address the high-priority training needs of those agencies that provide highway safety services. An especially important training need arises when new technology becomes available to augment highway safety services.

NHTSA sponsored the preparation of this training package in response to such a technological development. Preliminary Breath Testing (PBT) devices provide a means of improving a police officer's ability to evaluate suspected drinking-driving violators. A reasonably accurate, reliable, and easy-to-operate PBT can supply an on-the-spot indication of the suspect's blood alcohol concentration (BAC) that will be of considerable value to the officer's decision to arrest or not to arrest. Proper use of PBT's therefore is expected to lead to more effective enforcement of drinking-driving laws and, in turn, to reduction of alcohol-related crashes and fatalities.

In recent years NHTSA and various private manufacturers have substantially advanced PBT technology. There now exist a number of types of these devices, each employing technically sound operating principles and promising reasonably accurate and reliable indications of BAC at reasonable cost. Several of these PBT models have been subjected to extensive field testing that has demonstrated a significant increase in enforcement effectiveness. Increased use of these devices by law enforcement agencies is anticipated. Development of this training program was undertaken to provide the instruction and motivation necessary for the fully effective employment of PBT devices.

This training has been designated as the Preliminary Breath Testing for Drinking-Driving Enforcement Course. It is a 1-day course comprised of six units, or lessons.

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I. Introduction

This *Instructor's Lesson Plans Manual* has been prepared to aid the instructor in teaching a basic course in Preliminary Breath Testing (PBT) operation. The overall objective of the course is to *improve the effectiveness of drinking-driving enforcement* through the proper and efficient use of PBT instruments. One factor that diminishes effectiveness of drinking-driving enforcement is the difficulty of determining whether a suspect legally is under the influence of alcohol, i.e., determining if sufficient probable cause for arrest exists. Traditional roadside tests, such as walking-the-line or finger-to-nose exercises, have some value in assessing the suspect's state of impairment/intoxication. However, the consensus of expert opinion is that many alcohol-impaired motorists can perform these traditional tests sufficiently well to deny the officer probable cause to arrest. It is also felt that some individuals who are not legally impaired occasionally perform these tests poorly. Especially in borderline cases, officers need a *better* means of testing the suspect's degree of impairment.

Preliminary breath testing provides this better means. Virtually all States' laws provide that a blood alcohol concentration (BAC) above a specified level gives rise to a presumption that the person is under the influence of alcohol. A simple roadside breath test can quickly be administered to determine if a suspect has reached that specified level. Together with the officer's expert observations and the results of traditional tests, the information provided by the PBT should lead to more accurate assessment of the suspect's state of impairment. In turn, this should improve drinking-driving enforcement in the following three ways:

- There should be an increase in the number of drinking-driving arrests, since the PBT will support other evidence necessary to make the arrest.
- Since the PBT will help to diminish the violator's ability to mask impairment, the average BAC of persons arrested should decrease, and shift closer to the specified presumptive limit.
- There should be a decrease in the proportion of cases where the arrested driver's BAC proves to be below the presumptive limit for not being under the influence.

The ultimate goal of this course is to bring about these improvements. To achieve this, the trainees must be taught how to operate the PBT device. They must also be instructed when to use the device, and how to apply the information it provides to the arrest/no arrest decision; this instruction must be compatible with, and requires an understanding of, the state's laws and the department's policy and procedures concerning prearrest screening. Finally, the trainees must be motivated to use the PBT. That is, they must have a basic understanding of how the instrument measures blood alcohol concentration and why blood alcohol concentration is a valid indication of impairment. They also must be informed of how the instrument will improve their own enforcement efforts.

The course has been designed to achieve specific *trainee performance objectives* that support the ultimate goal of improved enforcement. The performance objectives define what it is that the trainee is expected to be able to do as a result of completing the course, namely, to:

1. Describe the purpose, benefits, and effectiveness of PBT's for drinking-driving enforcement.
2. Identify and describe the laws, regulations, policies, and procedures that affect drinking-driving enforcement in general and prearrest screening in particular.
3. Describe the basic principles and types of chemical tests used in drinking-driving enforcement.
4. Identify general types of PBT equipment and describe their operating characteristics, accuracy, and reliability.
5. Acquire and demonstrate basic skills in operating PBT's.

The instructor's principal job is to conduct the course in such a way that these performance objectives are achieved. To do so, he must be thoroughly familiar with all of the subject matter. In particular, he must be skilled in the operation, inspection, and calibration of the PBT instrument(s) used by the trainees' department and he must be well acquainted with the department's policies and procedures and the State's laws that relate to prearrest screening. He must also be skilled as an instructor. He must know, and be able to apply, a wide variety of instructional methods and be able to use various instructional aids to ensure that an effective learning environment is provided. Most important, he must be able to use lesson plans effectively and to adapt them to the needs of a particular group of trainees. As part of his overall teaching duties, he must be able to evaluate trainees' performance as well as his own performance as an instructor.

Since this course is made up of six lessons, or units, that are fully independent as to content coverage and presentation, more than one instructor can be used. That is, for any given unit, a specialist in that unit's topic can serve as the instructor. It is assumed, of course, that any instructor will be qualified as a teacher through instructor training and experience.

The six units, or lessons, are designed to be completed within 1 day. Each unit is an independent module designed to achieve specific training objectives. The content and purpose of each unit are summarized below.

Unit 1—Course Overview and Introduction (25 minutes)

Course objectives; concept and purpose of prearrest screening; course content and schedule; administrative matters.

Unit 1 is a preparatory phase for the main body of the course and is intended to ensure that the trainee knows what is expected of him and what topics will be covered.

Unit 2—The Legal and Operational Environment (1 hour, approx.)

Statutes defining drinking-driving offenses; implied consent law; illegal per se law; prearrest screening law; department policy and procedures.

Unit 2 is designed to ensure that the trainee can identify and describe the laws, regulations, policies, and procedures that affect drinking-driving enforcement and prearrest screening. Focus is placed on the elements of drinking-driving offenses and on the constraints and limitations applicable to prearrest screening.

Unit 3—Overview of Chemical Testing (45 minutes)

Purpose and importance of chemical testing; types of chemical tests; principles of breath testing; breath analysis techniques.

Unit 3 acquaints the trainee with the importance of blood alcohol concentration as an indicator of alcohol impairment and with the principles and types of tests used to determine blood alcohol concentration. Focus is placed on the rationale behind selection of a specified presumptive limit of blood alcohol concentration and on the scientific basis and technical limitations of breath tests.

Unit 4—PBT Equipment (30 minutes)

Types of PBT instruments; PBT effectiveness.

Unit 4 ensures that the trainee can identify general types of preliminary breath testing devices, the principles they employ to analyze breath samples, their accuracy and reliability, and the kinds and magnitude of benefits they provide for drinking-driving enforcement. The material covered both sets the stage for hands-on training in PBT operation and motivates trainees to accept and use PBT's.

Unit 5—PBT Operation (2 hours and 10 minutes, approx.)

General description of PBT(s) used by trainees' department; instrument features and operating principles; test requirements and operating procedures; inspection and calibration procedures; trainee practice.

Unit 5 ensures that trainees learn how to operate the PBT device(s) employed by their department. It provides for thorough presentation and demonstration of PBT operating procedures and also provides ample hands-on practice for each trainee.

Unit 6—Course Summary (30 minutes)

Course recapitulation; trainee evaluation; course evaluation; completion and certification.

Unit 6 summarizes the course, and provides an opportunity to determine whether the trainee performance objectives have been achieved. It also provides an opportunity to evaluate the course itself and to identify potentially valuable revisions that will improve training effectiveness.

II. Organization of the Lesson Plans

The main body of this manual consists of the Lesson Plans that the instructor will follow in conducting each unit. The lesson plan for each unit commences with a description of the unit's training objectives and requirements. The requirements include handout materials, suggested illustrations, reference sources, and specific tasks which the instructor must perform in preparation for conducting the unit.

The contents of each lesson plan are subdivided into *segments*, or subunits, which define the major topics of each unit. A time estimate is provided for each segment to guide the instructor in maintaining the proper schedule. The segments comprising each unit are listed below:

Unit 1—Course Overview and Introduction
- Introduction (5 minutes)
- Overall Course Objective (3 minutes)
- Concept and Purpose of Prearrest Screening (6 minutes)
- Specific Performance Objectives (4 minutes)
- Course Content and Schedule (5 minutes)
- Administrative Matters (2 minutes)

Unit 2—The Legal and Operational Environment
- Introduction (4 minutes)
- Drinking-Driving Statute Type 1: Driving while Intoxicated (DWI) (15 minutes)
- Drinking-Driving Statute Type 2: Driving with Ability Impaired (DWAI) (10 minutes)
- Drinking-Driving Statute Type 3: Illegal Per Se (10 minutes)
- Legal Basis for Chemical Test of BAC: Implied Consent (6 minutes)
- Legal Basis for Prearrest Screening (10 minutes)
- Policy and Procedures Relating to Drinking-Driving Enforcement (10 minutes)
- Review and Summary (5 minutes)

Note: Relatively few States have all three types of drinking-driving statutes; hence, the expected time for Unit 2 (nominally 1 hour) is less than the total time requirements of the listed segments.

Unit 3—Overview of Chemical Testing
- Introduction (3 minutes)
- Purpose and Importance of Chemical Testing (10 minutes)
- Types of Chemical Tests (10 minutes)
- Principles of Breath Testing (12 minutes)
- Breath Analysis Techniques (5 minutes)
- Review and Summary (5 minutes)

Unit 4—PBT Equipment
- Introduction (3 minutes)
- Types of PBT Instruments (7 minutes)
- PBT Effectiveness (15 minutes)
- Review and Summary (5 minutes)

Unit 5—PBT Operation
- Introduction (3 minutes)
- General Description of the Specific Instrument (2 minutes)
- Instrument Features and Operating Principles (15 minutes)
- Test Requirements and Operating Procedures (30 minutes)
- Inspection and Calibration Procedures (30 minutes)
- Trainee Practice (50 minutes)

Unit 6—Course Summary
- Introduction (3 minutes)
- Course Recapitulation (20 minutes)
- Trainee Evaluation (optional)
- Course Evaluation (4 minutes)
- Completion (3 minutes)

The format of the lesson plans consists of three vertical columns. The left column contains the time estimates for each segment. The middle column contains the detailed topical material, or main body, of the segments. The right column provides notes to guide and assist the instructor in presenting the topical material.

Two separate sets of lesson plans have been prepared for Unit 2 (The Legal and Operational Environment). The first set is a general outline with no reference to specific statutes, court rulings, or departmental policy and procedures. Since this material varies from State to State and department to department, *the instructor must prepare his own lesson plans for this unit.* The general outline serves as a model for the instructor to follow in preparing his lesson plans. The second set of plans for Unit 2 serves as an *example* of what the instructor should produce. These plans are based on a hypothetical State and department, and reflect a realistic (but fictional) set of laws, case laws, and departmental regulations.

Several different sets of lesson plans also have been prepared for the first five segments of Unit 5 (PBT Operation). Each set corresponds to a particular PBT device, e.g., ALERT, Alco-Sensor, etc. It is very likely that one of these sets of lesson plans will correspond to the PBT instrument used by the trainees' department; in such a case, the instructor need simply select the appropriate set of lesson plans. However, it is possible that the department uses a PBT device for which no lesson plans have been prepared. This would most likely occur when a PBT became available after this course was developed. The instructor in that case must prepare his own lesson plans for the first five segments of the unit, using the available plans as a model.

A single set of lesson plans has been developed for the final segment of Unit 5 (Trainee Practice

Segment). The teaching requirements and procedures for practice are common to all PBT instruments. It should be noted that the Trainee Practice Segment only covers PBT *operation;* i.e., no provision has been made for practicing PBT *calibration*. This reflects the following facts:

- Certain PBT instruments (disposable type) do not require calibration.
- Many law enforcement agencies assign the responsibility for PBT calibration to a select group of individuals who receive special training for that assignment; in those cases, the patrolman typically is not expected nor authorized to calibrate his own PBT.

It is felt that all PBT users should have knowledge and understanding of calibration procedures, so that they will be fully conversant with the requirements and limitations of their instruments. The fifth segment of Unit 5 is designed to provide this knowledge and understanding. However, the acquisition of skills in *conducting* calibrations is considered beyond the scope of this course.

If it is the department's policy to certify all PBT users as *calibrators*, this course must be augmented with a calibration practice segment. The instructor and training administrator share the responsibility for developing the plans, procedures, and format for such practice.

III. Selection and Adaptation of the Lesson Plans

The trainee performance objectives are intended to be achieved by all trainees. However, it is recognized that some trainees may already have achieved certain of these objectives prior to enrollment in the course, due to their on-the-job experience or previous instructional programs. For example, an officer who is a certified breath examiner specialist (operator of an evidentiary breath testing device) usually will already possess sufficient knowledge of the principles and types of chemical tests used in drinking-driving enforcement. Similarly, experienced officers with substantial prior exposure to drinking-driving enforcement might already have thorough understanding of the relevant laws, regulations, policies, and procedures. In cases where it is apparent that virtually all trainees have satisfied one or more of the performance objectives, it will be possible to delete parts or all of certain units and conduct a shorter, tailored version of the course. The instructor and the training program administrator share the responsibility for determining the possibility of deleting certain units or unit segments. The following guidelines apply to this responsibility:

- Unit 1 (Overview and Introduction) and Unit 5 (PBT Operation) constitute the *essential nucleus* of the course, and must be presented to *all* trainees. However, the content of Unit 1 must be modified to reflect any other deletions in subsequent units.
- Unit 2 (The Legal and Operational Environment) should be included in the course if any of the following conditions apply:
  - Substantive changes recently have occurred in the State's laws or regulations governing drinking-driving enforcement, chemical testing, or prearrest screening or in the department's enforcement policy or procedures. Revision of the presumptive blood alcohol level, enactment of a prearrest screening law, or deployment by the department of selective drinking-driving enforcement patrols would be examples of substantive changes.
  - There have been recent case law decisions that affect PBT deployment.
  - An appreciable number of the trainees have less than 2 years' experience in traffic law enforcement.
  - An appreciable number of the trainees made fewer than two drinking-driving arrests during the past year.
  - There is any other indication that the trainees' knowledge of these laws, policies, or procedures is deficient.
- Unit 3 (Overview of Chemical Testing) should be included unless virtually all trainees have completed formal programs of instruction in this area. Certification as a breath examiner specialist would indicate that the trainee has adequate knowledge of this topic, as would his prior completion of a breath testing familiarization program. Even when it is apparent that the trainees possess a good working knowledge of chemical testing principles and techniques, the instructor should plan to include at least a brief review of the segment dealing with the purpose and importance of chemical tests. This emphasizes the relevance and justification of the presumptive blood alcohol concentration limit as an indication of impairment and will enhance trainees' motivation to accept and use PBT's.
- Unit 4 (PBT Equipment) is considered to be extremely desirable material. This should always be included in the course, unless the trainees possess substantial hands-on experience with other PBT instruments. Even then, the instructor should at least include a summary of the segment dealing with PBT effectiveness to ensure that trainees are motivated to accept and use these instruments.
- Some form of trainee and course evaluation always is required.
- Unit 6 (Summary) will adequately satisfy this requirement when the complete course has been presented. However, it may be possible to dispense with Unit 6 if only the essential nucleus units are to be conducted.

As a general rule, *all units should be included in their entirety unless there is sufficient direct evidence that their training objectives have been met previously by the trainee group.* If there is any doubt that a particular unit (or unit segment) is needed for a given group, the trainees' knowledge of the relevant subject matter should be pretested.

In addition to deciding which units and unit segments are to be conducted, the instructor and training administrator share the responsibility for *adapting* the lesson plans to the requirements of the trainees' State and department. The authors of the course sought to write lesson plans that would be as generally applicable as possible. Nevertheless, there remains a need to obtain and include a considerable amount of locally relevant materials. Units that require a good deal of local adaptation are as follows:

- Unit 2 (The Legal and Operational Environment) consists almost exclusively of locally relevant materials. Copies of all State and local laws and regulations dealing with drinking-driving offenses, chemical testing, and prearrest screening must be obtained; descriptions of applicable departmental policy and procedures must be accessed; so too must be pertinent court rulings and case law decisions.
- Unit 4 (PBT Equipment) should be made as relevant as possible to the particular State and department, particularly in the segment deal-

ing with PBT effectiveness. The best means of doing so will be to obtain and include locally based statistics concerning how PBT's have affected arrest rates and average BAC of arrest within trainees' State and department. Of course, this can be done only if the State and, department have been using PBT's for some time.

- Unit 5 (PBT Operation) must be adapted to reflect the specific PBT instrument(s) used by the trainees' department. As indicated earlier, this adaptation will be accomplished in most cases simply by selecting one of the already prepared sets of lesson plans for Unit 5. But if the department uses a PBT device that was not available when this course was developed, a new set of lesson plans will have to be prepared. The requirement for selecting (or developing) training material for Unit 5 also applies to the Trainee Instructional Manual. Separate versions of that document's Unit 5 also have been prepared for distinct PBT instruments. *The instructor must remove the versions that do not correspond with the department's instrument(s) before distributing the manual to trainees.*

Once the instructor has determined which units and unit segments are to be conducted and has adapted the lesson plans and course documents to his local needs, he must obtain or prepare all instructional aids necessary to enhance learning. A separate document entitled *Recommended Training Aids* describes all visuals and other instructional aids that are considered necessary to support the lesson plans. These aids are also referenced in the lesson plans themselves. The recommended aids are relatively simple and consist primarily of handouts, chalkboard presentations, and charts, figures, narrative text, etc., suited to slide or transparency projection. No elaborate aids, such as filmstrips, motion pictures, etc., are considered necessary. The instructor should be prepared to use all recommended aids. He also should feel free to augment these with any other aids that he feels will enhance learning.

IV. Scheduling Lessons

The total course requires *approximately* 5 hours and 20 minutes of classroom and workshop instruction, excluding meals and breaks. Actual training time may be greater or less than that, depending upon the following factors:

- The possibility of deleting all or parts of certain units, as previously discussed.
- The number and complexity of the State's laws and department's policies and procedures concerning drinking-driving enforcement and prearrest screening; if relatively complex, these could require that as much as 1 hour and 20 minutes be devoted to Unit 2; if relatively simple, the unit might be completed in as little as 40 minutes.
- The type and number of PBT instruments to be covered; if the trainees are to be taught to operate two *distinctly different* PBT devices, Unit 5 could require as much as 4 hours and 20 minutes; if they are to be taught to operate only one relatively simple (i.e., disposable-type) PBT, the unit might be completed in less than 2 hours.

It also should be noted that the nominal training time includes no provision for formal trainee evaluation, i.e., written tests or skills demonstration. If formal testing is desired, an additional hour or more could be required. The lesson plans for Unit 6 do provide for *informal* trainee evaluation via oral questioning during the course recapitulation segment.

The schedule of lessons should be adapted to the material to be covered. Essentially, no hard-and-fast rules for scheduling are considered necessary. However, the units should be presented in the sequence in which they appear in this manual, and sufficient break time should be provided to prevent fatigue and to maintain trainees' interest and motivation. In particular, it is recommended that at least a brief break be taken prior to the trainee practice segment of Unit 5.

One *possible* schedule for the course is shown in Figure 1. This assumes that the nominal 5 hours and 20 minutes of instruction is appropriate and provides for a 1-hour lunch break and 20-minute morning and afternoon breaks.

Sample Course Schedule

Time	Activity
9:00 - 9:25 AM	**Unit 1** Course Overview and Introduction
9:25 - 10:25 AM	**Unit 2** The Legal and Operational Environment
10:25 - 10:45 AM	**Break**
10:45 - 11:30 AM	**Unit 3** Overview of Chemical Testing
11:30 - NOON	**Unit 4** PBT Equipment
12:00 - 1:00 PM	**Lunch**
1:00 - 2:20 PM	**Unit 5** PBT Operation (up to commencement of trainee practice)
2:20 - 2:40 PM	**Break**
2:40 - 3:30 PM	**Unit 5** PBT Operation (practice segment)
3:30 - 4:00 PM	**Unit 6** Course Summary

V. Lesson Plans

This section contains the plans for the presentation of each of the six units. The organization and content of the lesson plan was described in Section II, page 5. It is believed that a trained instructor will be able to use these plans with no difficulty. However, as an aid to even the experienced instructor, the following comments are offered:

- The majority of each lesson plan consists of the topic outline. This is only an *outline* in which the topics to be covered are identified. It is not a full discussion or treatment of any of the topics.
- In preparing to present a lesson, the instructor should use this outline to review the covered topics. The instructor should then satisfy himself that he is ready to teach the topics and respond to any questions or discussion. As needed, the instructor should refer to the subject matter sources, e.g., the statutes and procedures, textbooks, or equipment manuals.
- In no event should an instructor use the lesson plan as a "script." It is not meant to be read to the class.
- It is strongly suggested that each instructor annotate the lesson plans he will be teaching and otherwise adapt them to his personal stylie.
- In particular, the suggested time for each topic, the *Instructor Notes* and the *Instructor Tasks* should be adapted by each instructor. In each of these areas, the printed material is for *guidance;* it is not intended to be rigidly prescriptive.
- A final comment on adaptation is that when more than one instructor is to be used, they should carefully integrate their activities. This can be accomplished, in part, by a joint review of the lesson plans. In this way, each topic can be presented so that it relates meaningfully to preceding and subsequent lessons.

Unit 1
Course Overview and Introduction

Time:
25 minutes

Objectives

Provide the trainee with sufficient information for him to:

- Describe the objectives of the course.
- Describe the concept and purpose of preliminary breath testing.
- Describe the technical scope and schedule of the course.

Requirements

Handout Materials

- Trainee Instructional Manuals (one per trainee and instructor).
- Course enrollment forms (if applicable).

Suggested Illustrations

- Statement of overall course objective.
- Definition of preliminary breath test.
- List of specific performance objectives of course.
- Course schedule and content.

Instructor Tasks

The instructor must familiarize himself thoroughly with the structure and contents of this unit. The unit comprises the following segments:

1. Introduction.
2. Overall course objective.
3. Concept and purpose of preliminary breath testing.
4. Specific performance objectives.
5. Course content and schedule.
6. Administrative matters.

The lesson plans that have been prepared for the "Course Content and Schedule" segment presume that all six units will be presented. If parts or all of certain units are to be deleted for this implementation of the course, the instructor must revise these lesson plans to reflect the deletions.

The instructor must obtain or prepare all visuals and other instructional aids specified in the lesson plans. He should feel free to augment these with additional instructional aids that he feels will enhance learning.

If trainee enrollment forms are required, the instructor must obtain sufficient copies of each form and have them available for distribution at the end of this unit.

The instructor must prepare the Trainee Instructional Manual for distribution. In particular, he must ensure that the material provided in Unit 5 of that manual is appropriate to the specific PBT instrument(s) used by the trainees' department.

Unit 1 – Contents

Introduction

Welcoming Remarks

- **Welcome to the Preliminary Breath Testing for Drinking-Driving Enforcement Course**
  - Basic course in the purpose and operation of Preliminary Breath Testing (PBT) instruments.
  - Fundamental goal is to train each of you to operate PBT instruments.
  - It is expected that this course will help you to become more effective in detecting and apprehending drinking-driving violators.
- **Instructor Introduction**
  - Principal instructor (name, relevant background, etc.).
  - Instructor aides (names, etc.).
- **Trainee Instructional Manual**
  - Basic reference source for trainees.

Unit Title and Objectives

- Unit Title—"Course Overview and Introduction"
  - First of ____ units that make up the course. Purpose of this unit is to "set the stage" by previewing what it is we hope to accomplish.
- Unit Objectives
  - Describe objectives of the course.
  - Describe concept and purpose of preliminary breath testing.
  - Describe technical scope and schedule of course.
  - Complete certain administrative requirements.

Unit Contents

- Review the overall objective of the course and the relationship of prearrest screening to that overall objective.
- Review the specific performance objectives, i.e., what the trainee is expected to be able to do after completing the course.
- Review the material that will be covered in the subsequent units of the course.

Unit 1 – Notes

Course title on chalkboard.

Write "PBT" on chalkboard.

Names on chalkboard.

Hand out Trainee Instructional Manuals.

Unit title on chalkboard.
As appropriate for this implementation of the course.
Refer trainees to unit objectives in Trainee Instructional Manual.

Relate to unit objectives.

Unit 1 – Contents

Overall Course Objective

Statement of Objective

- "To improve the effectiveness of drinking-driving enforcement through the proper and efficient use of PBT instruments."
- *Effective enforcement* requires that the police officer be able to identify motorists who are under the influence of alcohol.
- Also requires that the officer be able to recognize evidence relating to drinking-driving violations and to make arrests when the evidence is obtained.
- Improved effectiveness will result in more arrests and convictions of drinking-driving violators, leading ultimately to fewer motor vehicle accidents involving alcohol.

Concept and Purpose of Prearrest Screening

Relationship to the Overall Objective

- Prearrest screening is one means of identifying a drinking-driving violator.
- It is a test that can be applied to help the officer determine whether the suspect is under the influence of alcohol.

Preliminary Breath Test

"A prearrest *breath test* taken during *investigation* of a possible drinking-driving violation to obtain an indication of the suspect's *blood alcohol concentration*."

- Blood Alcohol Concentration (BAC) means the percentage of alcohol in the person's blood.
- BAC is *one* indication of whether the person is under the influence of alcohol. (Emphasize the following):
  - It is not the *only* indication (unless the DWI statute is an illegal per se law).
  - The officer's judgment and other evidence must be taken into account.
  - However, knowing the individual's blood alcohol concentration will be very helpful in forming a correct judgment.

Unit 1 – Notes

Display visual 1-1.

Ask trainees, "How will prearrest screening help to improve drinking-driving enforcement?" Guide discussion toward concept of identification of violators.

Display visual 1-2.

Differentiate between presumptive law and illegal per se.

Ask trainees to describe some other indications of alcohol impairment.

Emphasize that PBT is nonevidential in nature and therefore not affected by an illegal per se law.

PBT instruments have been tested extensively in both the laboratory and the field.

- They have been found to improve officers' ability to identify drinking-driving violators, and they have helped to increase arrests.
- They have proved to be reasonably accurate and reliable, and they have been well accepted by officers.
- The PBT is a worthwhile tool.
  - But it must be used properly.
  - And it is *not* a substitute for your judgment.

Specific Performance Objectives

Upon completion of this course, you are expected to be able to:

- Describe the purpose, benefits, and effectiveness of PBT's for drinking-driving enforcement.
- Identify and describe the laws, pertinent case law decisions, regulations, policies, and procedures that affect drinking-driving enforcement and prearrest screening.
- Describe the basic principles and types of chemical tests used in drinking-driving enforcement.
- Identify the PBT instruments that are used for prearrest screening and describe their operating characteristics, accuracy, and reliability.
- Demonstrate the basic skills required to operate PBT instruments.

Course Content and Schedule

In addition to this introductory unit, the course consists of five other units, or lessons.

- **Unit 2—The Legal and Operational Environment**
  - The State's laws, regulations, court rulings, etc., that define and relate to drinking-driving violations.
  - The department's policies and procedures that affect our enforcement of these violations.

Unit 1 – Notes

Emphasize this point.

Display visual 1–3.

Briefly relate each performance objective to the overall course objective.

Display visual 1–4.

Point out that course emphasis will be on those aspects of the legal and operational environment that directly affect prearrest screening.

Unit 1 – Contents

- **Unit 3—Overview of Chemical Testing**
  - The various kinds of chemical tests used to measure BAC.
  - The scientific principles and limitations of these chemical tests.
- **Unit 4—PBT Equipment**
  - The types of instruments used for prearrest screening.
  - Review how these instruments have been found to improve drinking-driving enforcement.
- **Unit 5—PBT Operation**
  - Presentation of PBT operating procedures. Practice session.
- **Unit 6—Course Summary**
  - An opportunity to review and evaluate what has been learned.

Schedule of Units, Breaks, Lunch, etc.

Administrative Matters

Trainee enrollment (forms, etc.).

Point out location of cafeteria, rest rooms, etc.

Solicit trainees' questions concerning the contents of this unit.

Unit 1 – Notes

Breath tests will be emphasized, since they relate most directly to prearrest screening.

Point out that each trainee will have an opportunity to conduct numerous tests to ensure that he acquires the necessary skills.

As appropriate for this implementation of the course.

If applicable.

Unit 2
The Legal and Operational Environment

Time:
1 hour
(approximate)

Objectives

Provide the trainee with sufficient information for him to:

- Identify the statute(s) defining and relating to drinking-driving offense(s).
- Describe the elements of the offense(s).
- Describe the legal basis for and restrictions concerning prearrest screening.
- Describe case law relevant to drinking-driving enforcement and prearrest screening.
- Describe departmental regulations, policy, and procedures relevant to drinking-driving enforcement and prearrest screening.

Requirements

Handout Materials

- Texts of statute(s) defining drinking-driving offense(s).
- Text of Implied Consent Law.
- Text of Prearrest Screening Statute.

Suggested Illustrations

1. Texts of the above-listed statutes.
2. Elements of (each) drinking-driving offense.
3. BAC levels relevant to (each) drinking-driving offense.
4. Key aspects of the Implied Consent Law.
5. Key aspects of the Prearrest Screening Statute.
6. Key aspects of the Illegal Per Se Statute.

References

- State's vehicle and traffic laws.
- Recent court rulings relating to drinking-driving enforcement and prearrest screening.
- Erwin, R.E. *Defense of Drunk Driving Cases*. 3rd edition, New York: Matthew Bender, 1976.

Instructor Tasks

The instructor's first task is to familiarize himself thoroughly with the structure and contents of this unit. The unit comprises the following segments:

1. Introduction.
2. Each type of drinking-driving offense (separate segment for each type of offense defined in State's vehicle and traffic laws).
3. Legal basis for chemical test of BAC (implied consent).
4. Legal basis for prearrest screening.
5. Policy and procedures relating to drinking-driving enforcement.
6. Review and summary.

The lesson plans for these segments have been prepared only in outline form. The lesson contents are totally dependent on the State's laws, regulations, and court rulings and on the department's policy and procedures. The instructor's second and most important task is to prepare his own lesson plans for this unit, using the outline as a model.

To assist the instructor in preparing his own lesson plans, a sample lesson for a *hypothetical State and department* has been developed. This sample lesson can be found at the end of the outline for this unit.

The sample lesson assumes that the hypothetical State's vehicle and traffic laws specify two drinking-driving offenses: operating under the influence of alcohol and operating with BAC of 0.10% or higher. The latter is an example of a so-called "per se" violation and is presumed to be a recent addition to the State's vehicle and traffic laws. The State also is assumed to have an implied consent law, which requires a chemical test of blood, breath, or urine (under penalty of license revocation) for any person arrested for a drinking-driving offense. Finally, the hypothetical State is assumed to have recently enacted a prearrest screening law. This law requires any person stopped for a moving traffic violation to submit to an onsite chemical screening test of his breath (again under penalty of license revocation). Certain court rulings that are relevant to these statutes are cited in the sample lesson plans. These rulings also are hypothetical, although they are based on actual cases cited in Erwin's *Defense of Drunk Driving Cases*.

The instructor must obtain or prepare all visuals, handouts, and other instructional aids specified in the lesson plans. He should feel free to augment these with additional instructional aids that he feels will enhance learning.

The instructor should review the unit references and be prepared to use the references plus his own knowledge and experience to enrich the lesson plans as appropriate.

Unit 2 — Notes

Unit 2 – Contents

Introduction

Unit Title and Objectives

- Unit Title—"The Legal and Operational Environment"
- Unit Objectives
  - Identify statutes defining and relating to drinking-driving offense(s).
  - Describe the elements of the offense(s).
  - Describe the legal basis for and restrictions concerning prearrest screening.
  - Describe relevant case law.
  - Describe departmental regulations, policies, and procedures relevant to drinking-driving enforcement and prearrest screening.

Unit Content

- There are (is) ____ basic type(s) of drinking-driving offenses defined by law in this State.
  - Driving under the influence/while intoxicated (DWI, DUI, DUIL, OWI, etc.).
  - Driving with ability impaired by alcohol (DWAI, etc.).
  - Driving with illegal/proscribed BAC ("per se").
  - Other type(s) of drinking-driving offenses.
- Certain elements must be established in order to charge a suspect with one of these (this) offense(s).
- Certain kinds of evidence may be used to establish the elements of the offense(s).
  - Court rulings affect the types of evidence that can be used and how this evidence may be obtained.
  - Chemical tests can supply some of the evidence.
- Your department has established policies and procedures for enforcing these (this) drinking-driving statute(s).
  - These policies and procedures affect how you will investigate the suspects you encounter.
  - In particular, they affect how you will use preliminary breath testing devices.
- In this unit, we will review and discuss all of the laws, court rulings, policies, and procedures that affect drinking-driving enforcement in general and prearrest screening tests in particular.

Unit 2 – Notes

Unit title on chalkboard.

Refer trainees to unit objectives in Trainee Instructional Manual.

As appropriate for the trainees' State.

Relate to unit objectives.

Unit 2 – Contents

Drinking-Driving Statute: Type 1—Driving While Under the Influence of Alcohol

Definition of the Offense

- Text of statute
- Elements of the offense:
  - Driving/operating/physical control of vehicle.
  - Type(s) of vehicles covered by the statute.
  - Type(s) of roads, other locations covered by the statute.
  - Under the influence.
  - Other element(s), if any.

Blood Alcohol Concentration as a Measure of "Under the Influence"

- Concept of BAC:
  - Percentage of alcohol in the individual's blood.
  - BAC varies with amount of alcohol consumed, time spent drinking, individual's body weight, amount/type of food in stomach, etc.
  - Determined by chemical tests of suspect's blood, breath, urine, etc.
- BAC levels that are relevant to this offense:
  - BAC at or above ____%: person is presumed to be under the influence of alcohol within the meaning of this statute.
  - BAC less than (or equal to) ____%: person is presumed to be not under the influence of alcohol.
  - BAC between the above two limits: no legal presumption.
- BAC is presumptive (prima facie) evidence.
  - Can be used to help establish that the individual is under the influence.
  - Can be refuted by other evidence/testimony.
  - Is not absolutely required to prove that suspect is under the influence.

This segment will be given only if the trainees' State has such a statute.

Hand out copies of statute and display text of statute via visual.

Display and discuss each element.

Explain probable cause necessary to effect arrest.

Display and discuss limits. As per statute.

Mention that the legal basis for obtaining a test of suspect's BAC will be covered later in this unit.

Relevant Case Law Applicable to this Offense (As Appropriate for Trainees' State)

Drinking-Driving Statute: Type 2—Driving With Ability Impaired by Alcohol

Definition of the Offense

- Text of statute
- Elements of the offense:
  - Driving/operating/physical control of vehicle.
  - Type(s) of vehicles covered by statute.
  - Type(s) of roads, other locations covered by statute.
  - Ability impaired by alcohol.
  - Other element(s), if any.

Blood Alcohol Concentration as a Measure of "Ability Impaired"

- Concept of BAC
- BAC level relevant to this offense:
  - BAC at or above ____%; person's ability is presumed to be impaired by alcohol.
- BAC is presumptive (prima facie) evidence
  - Can be used to help establish that the person's ability is impaired by alcohol.
  - Can be refuted by other evidence/testimony.
  - Not absolutely required to prove that suspect's ability is impaired.

Cite relevant cases/rulings.

This segment will be given only if the trainees' State has such a statute.

Hand out copies of statute and display text of statute via visual. Display and discuss each element. Refer to elements of previous statute, if appropriate.

Point out that this is a lesser included offense, i.e., suspect cannot be convicted of both Type 1 and Type 2 offense for the same violation. Explain probable cause necessary to effect arrest.

Not necessary, if covered under discussion of previous statute.

As per statute. Compare with limits established for previously discussed offense.

Relevant Case Law Applicable to this Offense (As Appropriate for Trainees' State)

Drinking-Driving Statute: Type 3—Driving With an Illegal BAC ("Per Se")

Definition of the Offense

- Text of statute
- Elements of the offense:
  - Driving/operating/physical control of vehicle.
  - Type(s) of vehicles covered by the statute.
  - Type(s) of roads, other locations covered by the statute.
  - Specified illegal BAC.
  - Other element(s), if any.
- Chemical test of BAC is absolutely essential to obtain conviction for this offense.

Relevant Case Law Applicable to this Offense (As Appropriate for Trainees' State)

Legal Basis for Chemical Test of BAC

The "Implied Consent" law provides the legal basis for obtaining a chemical test of BAC on a drinking-driving suspect.

- Text of statute
- Key aspects of the law:
  - Suspect must be arrested.
  - Suspect must be informed of the provisions of the statute.
  - Test must be administered by qualified person.

Cite relevant cases/rulings.

This segment will be given only if the trainees' State has such a statute.

Hand out copies of statute and display text of statute via visual.

Display and discuss each element. Refer to elements of previous statutes, if any.

Point out that suspect cannot be convicted of both operating under the influence and of operating with illegal BAC for the same violation.

Cite relevant cases/rulings.

Write "Implied Consent Law" on chalkboard.

Hand out copies of statute and display text of statute on visual.

Display and discuss each aspect.

- Results of test may be admitted as evidence in court.
- Suspect may refuse the test (but penalties for refusal are specified in the law).
- Other aspect(s), if any.

- Types of test permitted
  (As appropriate for trainees' State).

Legal Basis for Prearrest Screening

This State has enacted a law (regulation) that permits a chemical test of BAC to be administered to (certain) drinking-driving suspects before they have been arrested.

- Purpose of law (regulation) is to provide investigating officer with a means for obtaining preliminary indication of suspect's BAC to help determine if suspect:
  - Is under the influence of alcohol.
  - Is impaired by alcohol.
  - Has an illegal BAC.
- Text of law (regulation) as appropriate for trainees' State.
- Key aspects of the law (regulation):
  - Circumstances in which the test is required/permitted.
  - Information that must be given to suspect.
  - Right of suspect to refuse (if applicable).
  - Penalties for refusal (if applicable).
  - Admissibility of screening test results in court.
  - Type(s) of screening test permitted.
  - Other aspect(s), if any.

Case Law Relevant to this Statute (Regulation) (As Appropriate for Trainees' State)

Cite cases upholding implied consent.

Point out that a more detailed review of chemical tests will be given in the next unit.

This segment will be given only if trainees' State has such a law or regulation.

Write "Prearrest Screening Statute (or Regulation)" on chalkboard.

Point out that a screening test does not affect the other elements of the drinking-driving offense(s).

Display text via visual. Hand out copies of law (regulation).

Display and discuss each aspect.

Point out that PBT results are generally not admissible as evidence in court to prove the ultimate fact of the DWI charge.

Cite relevant cases/rulings.

Policy and Procedures Relating to Drinking-Driving Enforcement

The department's general policy is to enforce the drinking-driving statutes to the maximum possible extent.

- At all times and circumstances, patrol officers are expected to be alert to and observant of evidence or indication of a drinking-driving violation.
- It is the department's policy that you will arrest any suspect whenever you have probable cause to believe that he or she has committed a drinking-driving violation (i.e., whenever there is sufficient evidence to conclude that all elements of the offense are present).
- The department provides preliminary breath testing devices to assist you in evaluating the specific element of the offense that deals with the suspect's degree of impairment.
  - **The PBT does not excuse or eliminate the need for you to conduct a thorough investigation to obtain all evidence relevant to the offense.**
  - The PBT is intended to aid but *not* to replace your judgment concerning whether the suspect is under the influence or impaired.
  - The PBT is to be used whenever necessary to aid your investigation, but its results are intended only to support all other evidence.

The department has established certain procedures and guidelines to ensure that its drinking-driving enforcement efforts are as effective as possible.

- Patrol procedures:
  - General patrol.
  - Traffic division patrol.
  - Selective drinking-driving enforcement patrol.
- DWI detection cues
- Drinking-driving investigation cues

Write "Policy and Procedures" on chalkboard.

Whenever a stop is made for any violation or when assisting motorists, etc.

Emphasize that there may be cases where the arrest should be made even though the suspect "passes" the screening test. (Reference is to pass/warn/fail PBT.)

Describe department's patrol procedures as they relate to drinking-driving enforcement.

Display visuals 2-1 and 2-2.

Describe types of evidence and other indications that the department considers to be relevant to drinking-driving enforcement.

The department has established certain guidelines and procedures for using PBT devices in drinking-driving investigations.

Whenever a drinking-driving arrest occurs, the following steps are to be taken:
(Steps as appropriate for trainees' department)

Review and Summary

There are ____ basic type(s) of drinking-driving offenses in this State.
(List types)

A chemical test of the suspect's BAC can supply useful evidence of these (this) offense(s).

The Implied Consent Law provides the legal basis for obtaining a BAC test that is admissible as evidence in court.

Describe and discuss department's procedures and guidelines.

List appropriate steps.

Ask trainees to define type(s) of offenses and their elements.

Ask trainees to state presumptive and illegal BAC levels.

Ask trainees to describe the key elements that must be satisfied to invoke the Implied Consent Law.

Prearrest screening is permitted to obtain a preliminary indication of a drinking-driving suspect's BAC.

The department has established certain guidelines concerning how PBT devices are to be used.

Introduction

Unit Title and Objectives

- Unit Title—"The Legal and Operational Environment: Sample Lesson Plans for Hypothetical State"
- Unit Objectives
  - Identify statutes (of hypothetical State) defining and relating to drinking-driving offenses.
  - Describe the elements of the offenses.
  - Describe the legal basis for and restrictions concerning prearrest screening.
  - Describe relevant case law.
  - Describe departmental regulations, policies, and procedures relevant to drinking-driving enforcement and prearrest screening.

Unit Content

- There are two basic drinking-driving offenses that are defined in the State's vehicle and traffic laws.
  - The first offense is called "operating a motor vehicle while under the influence of alcohol," abbreviated OUI (operating-under-influence).
  - The second offense is "operating a motor vehicle with ten-hundredths of one percent [0.10%] or more alcohol in the blood."

Ask trainees to describe the key aspects of the prearrest screening law (or regulation).

Ask trainees to state the guidelines.

Solicit questions from trainees concerning the contents of this unit.

Unit title on chalkboard.

Refer trainees to unit objectives in Trainee Instructional Manual.

Write "OUI" on chalkboard.

- This second offense sometimes is called a "per se" violation: driving with a certain percentage of alcohol in the blood is an offense "per se," or "by itself."

- Certain elements, or facts, must be established to charge a suspect with one of these offenses.
  - To charge him with OUI, it is necessary to establish that he is under the influence of alcohol.
  - To charge him with a "per se" violation, we must establish that his blood contains at least 0.10% alcohol.
  - There are other elements that we must also establish for either offense.
- Certain kinds of evidence may be used to establish the elements of these offenses.
  - Court rulings affect the types of evidence that can be used and how this evidence may be obtained.
  - Chemical tests can supply some of the evidentiary, not PBT evidence.
- Your department has established policies and procedures for enforcing these drinking-driving statutes.
  - These policies and procedures affect how you will investigate the suspects you encounter.
  - In particular, they affect how you will use preliminary breath testing device.
- In this unit, we will review and discuss all of the laws, court rulings, policies, and procedures that affect drinking-driving enforcement in general and prearrest screening tests in particular.

Drinking-Driving Offense Number 1: Operating Under the Influence

Definition of OUI

- Section 15-100.1 of the State's vehicle and UVC traffic laws states that:

  "It shall be unlawful for any person to operate or be in actual physical control of a motor vehicle upon a highway or upon public or private areas to which the public has right of access for vehicular use if that person is under the influence of alcohol . . . ."
- In order to arrest and convict a person for a violation of this statute, the following elements must be established:
  - A *motor vehicle* is involved; the State's VTL defines a motor vehicle as any vehicle propelled wholly or partially by a motor; this would include cars, trucks, buses, motorcycles, motor-assisted bicycles, etc.; it would exclude bicycles, horse-drawn carts, etc.

Write "PER SE" on chalkboard.

That is, he is affected by alcohol to a degree where his driving is unsafe.

Relate to unit objectives.

Hand out copies of Section 15-100.1 and display text via visual.

Display and discuss each element. Ask trainees to give examples of what each element would include and exclude.

- The person must be *operating or in actual physical control* of the vehicle; courts have held that it is sufficient to show that suspect was seated in driver's position with the ignition on, even if suspect is asleep and engine is stalled.
- Offense has occurred on a *highway or any area where public has right of vehicular access;* includes any road, street, alleyway, parking lot, etc., on which the public is permitted to drive.
- Suspect must be *under the influence* of alcohol; generally, this means that the person's ability to operate the vehicle has been reduced to the point where his driving has become unsafe.

The suspect's blood alcohol concentration, or the percentage of alcohol in his blood, is one indication of whether he is under the influence.

- BAC indicates the percentage of alcohol in the person's blood.
  - A person with a large amount of blood would have to drink more alcohol than would a person with a small amount of blood to reach the same BAC (i.e., the larger [heavier] a person is, the more he must drink to reach a given BAC).
  - BAC also varies with the time spent drinking and with the amount and type of food in the stomach.
  - The higher the BAC, the more impaired, or influenced, is the person's ability to drive.
- Section 15-100.3 of the VTL provides the following:
  - If the person has ten-hundredths of one percent (0.10%) or more of alcohol in his blood, he shall be presumed to be under the influence of alcoholic liquor.
  - If he has five-hundredths of one percent (0.05%)or less of alcohol in his blood, he shall be presumed not to be under the influence of alcoholic liquor.
  - If he has more than five-hundredths of one percent and less than ten-hundredths of one percent alcohol in his blood, it shall not be given prima facie effect in indicating whether he is under the influence of alcoholic liquor (i.e., no presumption either way).

Unit 2 – Notes

Emphasize that "operating or actual physical control" does not simply mean "driving."

Cite specific examples.

Emphasize that "under the influence" does not necessarily mean "drunk" or "intoxicated."

Write "BAC" on chalkboard.

Drinking on a full stomach will produce a lower BAC than will drinking on an empty stomach.

Display BAC limits and legal interpretations via chalkboard or visual.

Ask trainees: "Does this mean we cannot convict someone of OUI if his BAC is 0.09%?"

- BAC is presumptive, or prima facie, evidence of OUI, and therefore is very relevant to the case; but, it is not necessarily the key element of the case.
  - BAC is only one bit of evidence to help establish that the person is under the influence; other types of evidence also can be used to determine this.
  - It is not absolutely necessary to know the person's BAC in order to establish that the suspect is under the influence.
  - BAC is presumptive evidence, but not *overwhelming* evidence; it can be refuted in court by other evidence or testimony.
  - It therefore is important to keep in mind that the case should not be based solely on the suspect's BAC. (Emphasize this point).

Some recent court rulings have direct bearing on OUI arrests.

- In *Able vs. State,* evidence was sufficient to show defendant was in actual physical control of motor vehicle where vehicle was on shoulder of highway, engine was running, and defendant was found asleep slumped against driver's door.
- In *Baker vs. State,* conviction for OUI was upheld where arrest had taken place on driveway of State Police barracks, since this was an "area where public has right of vehicular access."
- In *Charles vs. State,* conviction for OUI was upheld where officer testified that "in my opinion, defendant's mental and physical factors were impaired due to use of some alcoholic beverage." It was not error for court to convict without evidence or testimony that defendant was *intoxicated.*

Drinking-Driving Offense Number 2: "Per Se" Violation

Definition of "Per Se" Violation

- Section 15-100.9 of VTL states that:

  "It shall be unlawful for any person to operate or be in actual physical control of a motor vehicle upon a highway or upon public or private areas to which the public has right of access for vehicular use if that person has ten-hundredths of one percent [0.10%] or more of alcohol in his blood . . . ."

Exception—Illegal Per Se law.

Ask trainees to describe other types of evidence of under-the-influence.

I.e., juries can acquit even if suspect's BAC is above 0.10%. Often will do so if there is no other evidence that suspect is under the influence.

Except with "Per Se" law, explain difference.

Hand out copies of Section 15-100.9 and display text via visual.

- Most of the elements of this offense are identical to the elements of OUI.
  - Operating motor vehicle, or actual physical control, and highway or public access areas are common elements.
  - However, it *is not* necessary to establish that suspect is under the influence.
  - It *is* necessary to establish that suspect's BAC is 0.10% or more.

Purpose of "Per Se" Statute in relation to OUI Statute

- "Per se" and OUI are included offenses.
  - Not possible to convict a person of both offenses for the same violation.
  - The two statutes simply provide two different definitions of the basic drinking-driving offense.
- The "per se" definition provides more clear-cut expression of one of the key elements of the offense.
  - "Under the influence" can be difficult to establish to the satisfaction of a judge or jury.
  - Making BAC of 0.10% unlawful *in itself* eliminates the need to establish "under the influence."
  - A per se law does eliminate the need for the 0.10% and above BAC presumptive provision of the retained DWI presumptive law.
  - However, there will be cases where it will not be possible to know the suspect's BAC; in such cases, suspect will be prosecuted for an OUI violation.
- **The "per se" statute does not eliminate the need to conduct a thorough investigation of a drinking-driving suspect.**
  - It still is necessary to establish probable cause for the arrest.
  - Evidence that the suspect is under the influence of alcohol forms an important part of probable cause.
- The "per se" statute is a recent addition to the State's vehicle and traffic laws.
  - No challenges to the law have yet been brought to or decided by court of appeals.
  - But, constitutionality of similar laws in other States has been upheld.

Legal Basis for Chemical Test of BAC

The so-called "Implied Consent Law" provides the legal basis for obtaining a BAC measurement for use as evidence in a drinking-driving case.

- Section 15-100.2 of VTL states that:

  "Any person who operates a motor vehicle upon a highway or upon public or private areas of this state to which the public has right of access for vehicular use shall be deemed to have *given consent to a chemical test,* or tests, of his

Display visual contrasting the elements of the two offenses.

Ask trainees: "Why, then, do we need both statutes? Why not drop OUI and retain only "per se?"

e.g., if suspect refuses to submit to chemical test.

Proof that the BAC testing device has been calibrated in accordance with State law or regulation may be necessary, as well as proof that the officer who administered the BAC test was legally certified.

Cite examples.

Write "Implied Consent Law" on chalkboard.

Hand out copies of Section 15-100.2 and display text via visual.

blood, breath, or urine for the purpose of determining the alcoholic content of his blood. The test or tests shall be administered at the direction of a law enforcement officer *only after placing such person under arrest* for any offense alleged to have been committed while the person was operating a motor vehicle when under the influence of alcohol . . . ."

- There are a number of key aspects of this law that must be properly understood.
  - The suspect must be *arrested;* probable cause must be established and the suspect must be notified that he is being charged with OUI or other drinking-driving offense.
  - The suspect must be *informed* of the requirements and provisions of the Implied Consent Law; specifically, he must be told of the penalties for refusing to submit to the chemical test.
  - The officer designates the *type of test* to be administered (blood, breath, or urine), except that, if the officer designates a blood test, the suspect may elect to take a breath test instead.
  - Some jurisdictions allow the defendant to designate the type of BAC test to be given.
  - The test or tests must be administered by appropriately qualified persons.
  - The suspect has the right to a second test of his own choosing; however, such second test will be at the suspect's own expense.
  - The chemical test results are admissible in court and shall be made available to the suspect.
- If the suspect refuses the test, none shall be given, but the following will occur:
  - Arresting officer shall submit a sworn report to the Commissioner of Motor Vehicles stating: that the person was validly arrested pursuant to Section 15-100.1; the reasons for such arrest; that such person was requested to submit to a chemical test or tests; that such person refused to submit to the test or tests.
  - Upon receipt of officer's report, the Commissioner shall notify such person of the date for hearing as to the reasonableness of the refusal to submit.
  - If, after granting such person an opportunity to be heard, it is not shown that the refusal was reasonable, Commissioner shall revoke the person's motor vehicle operator's license for 6 months.
  - Failure of person to appear for hearing also shall result in license revocation.

Display and discuss each aspect.

Discuss qualifications for each type of test.

Display and discuss results of a refusal to submit.

Various court rulings bear on the Implied Consent Law.

- First and most importantly, the constitutionality of the Implied Consent Law has always been upheld in this and other States.
- In *Davis v. State*, court ruled that implied consent applies to all persons arrested for OUI. Defendant had argued that OUI statute applies to persons "operating or in actual physical control" of motor vehicles, implied consent only to persons "operating." Court held that "operating" includes "actual physical control."
- In *Edwards v. State*, court ruled that implied consent was invoked properly, and chemical test was admissible, in a prosecution for manslaughter. Defendant was arrested for act (manslaughter) "alleged to have been committed while . . . operating. . . under the influence."

Legal Basis for Prearrest Screening

The State has recently enacted a statute that permits a preliminary breath test for BAC to be administered to *certain* drinking-driving suspects *prior* to their arrest.

- Purpose of this statute is to provide investigating officer with a means of obtaining preliminary indication of suspect's BAC to help determine:
  - If suspect is under the influence of alcoholic liquor.
  - If suspect has BAC of 0.10% or higher.
- A good example of a Prearrest Screening Statute is contained in Minnesota Highway Traffic Regulation Act 169.121.6, which states:

> Subd. 6. When a peace officer has reason to believe from the manner in which a person is driving, operating, or controlling a motor vehicle or has driven, operated, or controlled a motor vehicle, that the driver may be violating or has violated subdivision 1, he may require the driver to provide a sample of his breath for a preliminary screening test using a device approved by the commissioner of public safety for this purpose. The results of this preliminary screening test shall be used for the purpose of deciding whether an arrest should be made and whether to require the chemical tests authorized in section 169.123, but shall not be used in any court action except to prove that a chemical test was properly required of a person pursuant to section 169.123, subdivision 2. Following the screening test additional tests may be required of the driver pursuant to the provisions of section 169.123.
>
> The driver of a motor vehicle who refuses to furnish a sample of his breath is subject to the provisions of section

Unit 2 – Notes

Point out slight difference in wording of OUI and implied consent statutes.

Write "Prearrest Screening Law" on chalkboard.

169.123 unless, in compliance with 169.123, he submits to a blood, breath or urine test to determine the presence of alcohol or a controlled substance.

- There are a number of key aspects of this law that must be properly understood.
  - There must be grounds to believe that a moving traffic violation has occurred; however, not all suspected OUI situations will involve moving violations (e.g., suspect stopped at a random vehicle inspection roadblock).
  - The suspect must be *informed* of the requirements and provisions of the Prearrest Screening Law; specifically, he must be told of the penalties for refusing to submit to the onsite chemical screening test.
  - The chemical screening test must administered by a law enforcement officer who is a certified chemical screening test operator.
  - Screening test results not admissible in court as evidence of the ultimate fact to be proven.
- If the suspect refuses the onsite chemical screening test, none shall be given, but the refusal will be sufficient cause to revoke the suspect's license, in the same manner as provided in the Implied Consent Law if suspect refuses to submit to evidential chemical test.
- **It should be noted that the Prearrest Screening Law does not *preclude* a screening test in cases where there are no grounds to believe the suspect has committed a moving traffic violation.**
  - But, in those cases the suspect can refuse the screening test without penalty.
  - If a screening test is requested in those cases, the suspect must be informed that he has a right to refuse.
- The Prearrest Screening Statute is a recent addition to the State's vehicle and traffic laws.
  - No challenges to the law have yet been brought to or decided by court of appeals.
  - Constitutionality of similar laws in other States has been upheld.

Policy and Procedures Relating to Drinking-Driving Enforcement

The department's general policy is to enforce the OUI and "Per Se" laws to the maximum possible extent.

- At all times and circumstances, patrol officers are expected to be alert to and observant of evidence or indication of a drinking-driving violation.
  - Be aware of the times and places where OUI violations are most likely to occur.

Display and discuss each aspect.

Certification will be issued upon successful completion of this course.

Make sure that trainees fully understand this distinction.

Write "Policy and Procedures" on chalkboard.

- Be aware of the fact that any person stopped for a "routine" traffic violation *might* be under the influence.

- The department provides PBT devices to assist you in determining whether the suspect is OUI.
  - The PBT does not excuse or eliminate the need to conduct a thorough investigation to obtain all other possible evidence.
  - The PBT is intended to aid but *not* to replace your own judgment.
  - The device only *supports other* evidence that must be obtained.
- It is the department's policy that you will arrest any suspect whenever you have probable cause to believe that he or she is OUI.
  - Arranging for alternate transportation of the suspect in lieu of arresting is strictly prohibited.
  - Do not delude yourself into taking a chance by releasing the suspect.

The department has established certain procedures and guidelines to ensure that its drinking-driving enforcement efforts are as effective as possible.

- The department conducts three basic types of patrols that provide our best opportunities to apprehend OUI violators; you may be called upon to perform any of these types of patrol at any given time.
  - General precinct patrol: When performing this type of patrol, you are expected to be alert for all possible kinds of violations (traffic and non-traffic); this certainly includes being alert for OUI.
  - Traffic patrol: In this case, your major attention is devoted to traffic violations. OUI *might* be involved in any traffic violation you observe. Be alert for this possibility at all times, especially when and where OUI is most likely (weekend nights, near bars, etc.).
  - Selective OUI surveillance patrol: In this case, apprehension of OUI violators is your primary job. Follow up every possible indication of OUI.
- There are numerous indications that you should look for as evidence of possible OUI violation. Some of the most important *detection cues** are:
  - Turning with wide radius.
  - Straddling center or lane marker.
  - Appearing to be drunk.

*The visual cues are listed in descending order of probability that the person observed is driving while intoxicated.

Emphasize.

Emphasize.

May incur civil liability.

Display and discuss types of patrols used.

Emphasize that OUI enforcement is the responsibility of every officer, regardless of the type of patrol.

Ask trainees to give examples, then display detection cues via visual 2–1 or chalkboard.

- Almost striking object or vehicle.
- Weaving.
- Driving on other than designated roadway.
- Swerving.
- Slow speed (more than 10 MPH below limit).
- Stopping (without cause) in traffic lane.
- Following too closely.
- Drifting.
- Tires on center or lane marker.
- Braking erratically.
- Driving into opposing or crossing traffic.
- Signaling inconsistent with driving actions.
- Slow response to traffic signals.
- Stopping inappropriately (other than in lane).
- Turning abruptly or illegally.
- Accelerating or decelerating rapidly.
- Headlights off.

- There are numerous other indications that you should look for after you have stopped a suspect. Some of the more important of these *investigation cues* are:
  - Slurred/sluggish speech.
  - Facial expression (dazed, blank, lack of comprehension).
  - Odor of alcoholic beverage.
  - Smoking/gum chewing (attempt to hide odor of alcoholic beverage).
  - Overly slow or deliberate movements.
  - Fumbling, unsteady movement.
  - Loss of balance, poor coordination.
  - Eyes (dilated pupils, bloodshot, watery).
  - Disarrayed clothing.
  - Expressing urge to urinate.

The department has established certain guidelines and procedures for using PBT devices in drinking-driving investigations.

Emphasize that these cues may take on added importance at times and places where OUI is most likely to occur.

Point out that these cues are not necessarily violations in themselves, but still may be indicators of OUI.

Ask trainees to give examples, then display investigation cues via visual 2-2 or chalkboard.

Point out that none of these indicators, by itself, is absolute proof of OUI, but in combination they are strongly suggestive.

Display and discuss guidelines.

- In general, the PBT *should be used* whenever:
  - The suspect has committed a moving traffic violation and there is reason to believe he has been drinking.
  - Other evidence of OUI is inconclusive, i.e., you suspect he may be under the influence, but you lack probable cause to arrest.
- The department has specified that you will make the OUI arrest whenever the suspect "fails" the PBT test.

The department's procedures for processing an OUI arrest are as follows:

- All OUI suspects will be transported to the alcohol testing center at departmental headquarters.
  - Notify dispatcher of the arrest.
  - Arrange through dispatcher for an evidentiary breath testing instrument and certified operator to be available at the alcohol testing center (or qualified personnel and equipment for a blood or urine test).
  - *All* suspects will be restrained by handcuffs during the transport.
  - Notify dispatcher of starting and arrival times and mileage.
- Suspect's vehicle must be properly disposed of:
  - Normal disposition is to arrange for police tow truck to transport vehicle to headquarter's garage; wait at scene until tow truck arrives; have tow truck driver complete and sign vehicle transfer form.

Point out that even though the prearrest screening law permits the PBT to be used whenever the suspect has committed a moving traffic violation, it is not the department's policy to subject a violator to the test without at least some suspicion that he has been drinking.

Emphasize that even slight evidence of drinking is sufficient to warrant the PBT in this case.

Emphasize that the PBT test should be requested in this case even if no moving traffic violation has been committed.

Emphasize that this holds true even if other evidence of OUI is inconclusive.

Display and discuss processing procedures.

Or qualified personnel and equipment for a blood or urine test.

This procedure protects both the suspect and the officer.

- In certain cases it may be possible to entrust vehicle to a person accompanying the suspect; must verify that such person is not under the influence and is a licensed driver; suspect must agree to the transfer; both suspect and the other person must sign vehicle transfer form; dispatcher must be notified.

- Maintain continuous observation of suspect at alcohol testing center.
  - Inform suspect of implied consent provisions.
  - Observe evidentiary chemical test or complete test refusal form.
- Book suspect.

Unit 3
Overview of Chemical Testing

Time:
45 minutes

Objectives

Provide the trainee with sufficient information for him to:

- Describe the purpose and importance of chemical testing for drinking-driving enforcement.
- Identify the general types of chemical tests of BAC.
- Describe the basis for the validity of breath testing.
- Identify the general techniques used to analyze breath samples.

Requirements

Suggested Illustrations

- Curve showing accident probability as a function of BAC.
- Table displaying drinks required to achieve 0.10% BAC as a function of body weight.
- Types of chemical tests.
- Breath analysis techniques.

References

Alcohol and the Impaired Driver. A Manual on the Medicolegal Aspects of Chemical Tests for Intoxication. Committee on Medicolegal Problems, American Medical Association, Chicago, Illinois, 1968.

Erwin, R.E. *Defense of Drunk Driving Cases.* 3rd Edition, New York: Matthew Bender, 1976.

Instructor Tasks

The instructor must familiarize himself thoroughly with the structure and contents of this unit. The unit comprises the following segments:

1. Introduction.
2. Purpose and importance of chemical testing.
3. Types of chemical tests.
4. Principles of breath testing.
5. Breath analysis techniques.
6. Review and summary.

Throughout several of these segments, reference is made to the State's presumptive and/or "per se" BAC limit. The lesson plans, as written, presume that this limit is 0.10%. If the trainees' State has a different presumptive limit (e.g., 0.08%), slight modification of the lesson plans will be required.

The instructor must obtain or prepare all visuals and other instructional aids specified in the lesson plans. He should feel free to augment these with additional instructional aids that he feels will enhance learning.

The instructor should review the unit references and be prepared to use the references plus his own knowledge and experience to enrich the lesson plans as appropriate.

Unit 3 – Contents

Introduction

Unit Title and Objectives

- Unit Title—"Overview of Chemical Testing"
- Unit Objectives
  - Describe purpose of chemical testing for drinking-driving enforcement.
  - Identify the general types of chemical tests of BAC.
  - Describe basis for validity of breath testing.
  - Identify techniques used to analyze breath samples.

Unit Content

- Examine the role of BAC as an indication of alcohol influence.
- Review the substances, or parts, of the body that can be tested chemically to determine BAC.
  - Point out the advantages and disadvantages of each type of chemical test.
- Examine breath testing as a particularly important type of chemical test.
  - Review how breath tests can provide a measure of the percentage of alcohol in blood.
  - Point out some of the factors that can affect the accuracy and validity of breath tests.
- Review different means of analyzing breath samples.
  - Emphasize breath analysis techniques that apply to pre-arrest screening.

Purpose and Importance of Chemical Testing

Why is chemical testing important for drinking-driving enforcement?

- Chemical test determines a suspect's blood alcohol concentration.
  - Does *not* directly determine whether his judgment, coordination, reaction time, etc., are impaired or reduced.

Unit 3 – Notes

Unit title on chalkboard.

Refer trainees to unit objectives in Trainee Instructional Manual.

Point out that unit will focus on breath tests, while considering other types of chemical tests as well.

Relate to unit objectives.

Pose this question to trainees. Lead discussion toward the concept of the relevance and reliability of BAC as indicator of impairment.

- BAC is accepted as an *indicator* of alcohol impairment.
  - Statutes covered in previous unit in effect say that: If person's BAC is *0.10%* or more, his ability to drive a motor vehicle is impaired to an unsafe degree.

Is BAC of *0.10%* a fair indication that person's ability to drive a motor vehicle is impaired?

- American Medical Association has adopted the following as its statement of official policy:
  - *All* persons show definite loss of that clearness of intellect and control of themselves which they would ordinarily possess when the concentration is above 0.10%, and should be considered under the influence.
  - Although there is no minimal concentration at which there will be absolutely no effect from alcohol, it is recommended that persons with concentrations of 0.05% or less should not be prosecuted for driving under the influence.
  - When the alcohol concentration is between 0.05% and 0.10%, *a great many people will be under the influence,* but prosecution is recommended only when circumstances and results of physical examination confirm such influence.
- Research has shown that the odds of having a motor vehicle crash rise rapidly as BAC increases.
  - At 0.08% BAC, the average person is 4 times more likely to crash.
  - At 0.10% BAC, chances of crashing are 6–7 times normal.
  - At 0.12% BAC, chances are about 12 times normal.
  - At 0.15% BAC, chances of crashing are about 26 times normal.
- Relatively large amount of alcohol must be consumed to reach the level of *0.10%* BAC.
  - How many shots of whiskey or bottles of beer would *you* have to drink in 4 hours on an empty stomach to *just* reach the *0.10%* level?
  - Number of drinks required to *just* reach the 0.10% level.

Unit 3 – Notes

Or other presumptive or "per se" limit, an appropriate for trainees' State.

Pose this question to trainees.

Display policy via visual 3-1.

Emphasize "all."

Emphasize that AMA feels 0.10% is a conservative *limit, i.e., many persons are under the influence at lower BAC's.*

Display curve showing relationship between BAC and crash probability via visual 3-2.

Emphasize again that presumptive or "per se" limit is a conservative level.

Or other presumptive or "per se" level, as appropriate for trainees' State.

Display this question via visual 3-3. Ask trainees to write down their answers.

Point out that one bottle of beer contains about as much alcohol as one shot of whiskey.

Body Weight (lbs.)	*Drinks*
100–120	5
121–140	6
141–160	7
161–180	8
181–200	9
201–220	10
221–240	11

- Expert medical opinion, accident research, and our own common sense agree:
  - The State's presumptive (and/or "per se") BAC limits are certainly fair.
  - Persons at or above those levels *are* under the influence and *should* be arrested.

Types Of Chemical Tests

Any body fluid or substance that contains *water* can be analyzed to determine BAC.

- Alcohol dissolves readily in water.
- Alcohol is carried throughout the body by the bloodstream. Organs and tissues having the highest water content receive the most alcohol.
- Examples of body fluids and substances that can be analyzed to determine BAC include:
  - Blood itself.
  - Urine.
  - Saliva.
  - Spinal fluid.
  - Various tissues (brain, liver, lung, etc.).
  - Breath.

Purpose of any chemical test is to determine the concentration of alcohol in the *blood*.

- BAC is defined as *blood* alcohol concentration..
- The only *direct means* of measuring BAC is a blood test.
- Chemical tests of breath, urine, etc., provide *indirect* measurement of BAC.

Display via visual 3-4; ask trainees to compare answers with their previous guesses.

Ask how many had overestimated the number of drinks needed and how many had underestimated.

Write "water" on chalkboard.

Display visual 3-5.

Write "direct" and "indirect" on chalkboard and discuss the difference.

- These tests begin by measuring the concentration of alcohol in the particular substance (breath, urine, etc.).
- Based upon that measurement, one then calculates the concentration of alcohol in blood.
- Many indirect tests automatically perform this calculation.

- The term "indirect" does *not* mean "inaccurate."
  - Accurate measurement of BAC can be obtained from breath, urine, etc., testing.

Indirect chemical tests of BAC are based on the principle of *equilibrium*.

- "Equilibrium" means "a state of balance."
  - For our purposes, equilibrium means that the concentration of alcohol in one body fluid is the same as the concentration of alcohol in any other body fluid (e.g., percentage of alcohol in breath, urine, or saliva is proportional to percentage of alcohol in the blood).
- The point at which this balance is reached depends upon how much *water* is present in the two fluids.
  - If a body fluid has a higher proportion of water than does the blood, the percentage of alcohol in that fluid will be higher than the percentage of alcohol in the blood.
  - If the fluid has proportionately less water, it will also have proportionately less alcohol.
- Since we know the water content of all bodily fluids, we know what the ratio must be between the percent of alcohol in blood and the percentage of alcohol in the fluid.
- *Example:* We know that a given volume of blood contains 2100 times as much alcohol as the same volume of deep-lung breath.

Each type of chemical test has certain advantages and disadvantages.

- Test of body tissues (liver, brain, etc.) are useful for post-mortem analyses but obviously are unsuited to testing living persons.
- The primary chemical tests for living persons are blood, breath, and urine.

Emphasize this point.

Write "equilibrium" on chalkboard.

e.g., percent of alcohol in breath, urine, or saliva is proportional to percent of alcohol in blood.

Write "blood-breath" ratio: 2100-to-1" on chalkboard.

- Principal advantage of blood test is that it can be used with individuals who are unconscious or otherwise unable to cooperate.
- Principal disadvantages of blood test are:
  - Requires medical or laboratory personnel to take the sample.
  - Requires laboratory services for analysis.
  - Requires careful identification and handling to preserve the chain of evidence.
  - Does not provide an immediate result.
- Urine test has the advantage that it can be taken by nonmedical personnel.
  - But urine test shares most of the other disadvantages of blood test.
  - And urine test requires that the suspect be willing and able to cooperate.
- Breath test has several advantages over blood or urine tests.
  - Can be taken by nonmedical personnel.
  - Provides an immediate result.
  - Requires no laboratory services for analysis.
  - Usually is more acceptable to suspects than is blood or urine test.
- Principal disadvantage of breath test is that the suspect must be conscious and able and willing to cooperate.
  - But, vast majority of suspects arrested for drinking-driving offenses *are* conscious.
  - Implied Consent Law encourages suspects to cooperate.

Principles of Breath Testing

In order to understand the basic principles of breath testing, it is necessary to have a general knowledge of the respiratory system and process.

- The lungs provide the means by which gases are brought into and out of the body.
  - Oxygen is brought into the body.
  - Carbon dioxide and other waste products are taken out.
- The exchange of gases takes place in the deep part of the lungs, through tissues called the *alveoli*.
  - The alveoli take gases from deep-lung breath and pass them into the bloodstream (e.g., oxygen, tobacco smoke, inhaled fumes, etc.).
  - The alveoli also remove gases from the blood and pass them into deep-lung breath (e.g., carbon dioxide, water vapor, alcohol, etc.).
- Alcohol in deep-lung breath comes into equilibrium with alcohol in the blood.

Unit 3 – Notes

Display visual 3-6.

Write "alveoli" on chalkboard.

- The equilibrium ratio is 2100-to-1.
  - That is, the amount of alcohol in blood is 2100 times the amount of alcohol in the same volume of deep-lung breath.
  - If we know how much alcohol is present in a sample of the suspect's deep-lung breath, we can determine his BAC.

All breath tests for BAC work on the principle of obtaining and analyzing a sample of deep-lung breath.

- Deep-lung breath is called *alveolar breath.*
  - i.e., it comes from the alveoli.
- Breath from the upper part of the lungs and from the mouth is called *tidal breath.*
- Tidal breath is farther from the alveoli and therefore receives less alcohol.
  - The percentage of alcohol in tidal breath is less than the percentage of alcohol in alveolar breath.
- As an individual exhales, he expels a mixture of tidal breath and alveolar breath.
  - The first part of the exhalation consists almost entirely of tidal breath.
  - As he continues to exhale, a greater proportion of alveolar breath is expelled.
  - The last part of the exhalation (just before he runs out of breath) consists almost entirely of alveolar breath.
- In order to be as accurate as possible, the breath test should be based on alveolar breath.
  - A person usually must exhale for 5–6 seconds before eliminating most of his tidal breath.
  - Many breath testing instruments automaticaly get rid of the first 5–6 seconds of the breath sample, and trap the last portion of the exhalation.

There are several factors that can affect the accuracy of a breath test.

- First, the composition of the breath sample:
  - If the breath sample contains a mixture of alveolar and tidal breath, the sample will contain less alcohol than would a pure alveolar sample.
  - Therefore, the test result will be *lower* than the suspect's actual BAC.

Unit 3 – Notes

Refer to ratio on chalkboard.

Write "alveolar breath" on chalkboard.

Write "tidal breath" on chalkboard.

Display visual 3-7.

Emphasize that this factor is always in the suspect's favor: the breath sample composition cannot *produce a test result that is higher than suspect's actual BAC.*

- Second, residual mouth alcohol:
  - When a person takes a drink, some of the alcohol remains in the tissues of the mouth.
  - It requires 10–15 minutes for the alcohol left in the mouth to dissipate after a drink is taken.
  - If a breath test is taken less than 10 minutes after a drink, some of the residual mouth alcohol will be carried into the breath sample.
  - Then, the test result will be *higher* than the actual BAC.
  - Therefore, no breath test should be taken for at least 10–15 minutes following a drink.
- The third possible source of error is other substances, or contaminants, in the breath.
  - Alcohol is not necessarily the only substance that will react to a breath test for BAC.
  - Certain substances, such as acetone, ether, chloroform, acetaldehyde, or cigarette smoke *conceivably* could be present in the breath of some persons.
  - These substances might react on *certain types* of breath tests.
  - Important to note that these substances rarely are present in breath, and even when present usually appear in very low concentrations.
  - Also important to note that not all types of breath tests will show a reaction to these substances.
  - Most important to note that halitosis, food odors, and other substances normally present in breath will *not* show a reaction on a breath test for BAC.

Breath Analysis Techniques

There are a number of techniques that can be used to analyze breath samples to determine BAC.

- The common techniques are:
  - Oxidation/photometric (color change).
  - Gas chromatography.
  - Infrared absorption.
  - Electrochemical oxidation (fuel cell).
  - Semiconductor.
- In the oxidation/photometric type of breath testing instrument, breath sample is passed through a chemical that is sensitive to alcohol.
  - Alcohol reacts with the chemical and changes its color.
  - Amount of color change determines how much alcohol was present.
  - The color change can be observed visually or measured precisely through photoelectric means.

Unit 3 – Notes

Point out that residual mouth alcohol could also be produced by commercial mouthwashes, breath sprays, cough syrups, or any other substance containing alcohol.

Emphasize this point.

For prearrest screening in particular, other breath substances are of very minor concern.

Display visual 3–8.

- Instruments using gas chromatography physically separate the breath sample into each of its constituent substances.
  - Alcohol is one of the substances that is separated out.
  - After separation, the volume of alcohol present is measured directly.
- Instruments using the infrared absorption technique pass infrared radiation through the breath sample.
  - Alcohol absorbs energy from infrared radiation.
  - Amount of energy lost in the passage through breath sample determines how much alcohol is present.
- Instruments using electrochemical oxidation have a fuel cell as their principal component.
  - Fuel cell converts alcohol into an electric current.
  - Amount of current produced determines how much alcohol is present.
- Instruments that employ semiconductors also generate an electric current that is proportionate to the amount of alcohol present.
  - The semiconductor absorbs alcohol from the breath sample.
  - The alcohol increases the electrical conductivity of the semiconductor.
  - The amount of increase in conductivity determines how much alcohol is present.

The chemical reaction, electrochemical oxidation, and semiconductor techniques are the ones usually used in prearrest screening.

- Instruments using these techniques can be made relatively small and thus easily portable.
- These techniques require relatively little power and do not need liquids or other supporting materials that would be difficult to use in the field.

Review and Summary

Purpose of *any* chemical test is to determine the concentration of alcohol in the _____.

Ask trainees to name the substance (blood).

Tests of breath, urine, tissues, etc., provide indirect measurement of BAC.

Indirect tests can be used because the percentage of alcohol in any body fluids is in balance with the percentage of alcohol in the blood.

In particular, percentage of alcohol in blood is in equilibrium with percentage of alcohol in deep-lung breath.

Amount of alcohol in blood is greater than amount of alcohol in the same volume of alveolar breath.

If a breath sample contains a mixture of alveolar breath and tidal breath, results of the breath test will be (higher, lower) than actual BAC.

Unit 3 – Notes

Ask trainees what is meant by "indirect."

Ask trainees to state the technical term for "in balance" (equilibrium).

Ask trainees to state technical term for deep-lung breath (alveolar breath).

Ask trainees "how many times greater" (2100).

Ask trainees to state which is true.

A breath test should not be taken for at least 10 minutes after the subject had a cigarette, or a drink *was* consumed.

Three types of breath analysis techniques are most useful for prearrest screening.

BAC of 0.10% or more is considered an *indication* that a person is under the influence of alcohol.

- Some reasons why this is considered to be a conservative limit or indicator:
  - Medical opinion considers many people to be under the influence at lower levels.
  - Research shows chances of accident are 6–7 times normal at 0.10% BAC.
  - Relatively large quantity of alcohol must be consumed to reach 0.10% BAC.

Unit 3 – Notes

Ask trainees to state why.

Ask trainees to name these techniques (chemical reaction, electrochemical oxidation, semiconductor).

Modify if trainees' State has a different presumptive limit.

Ask trainees why this is a conservative limit.

Solicit questions from trainees concerning the contents of this unit.

Unit 4
PBT Equipment

Time:
30 minutes

Objectives

Provide the trainee with sufficient information for him to:

- Identify and describe general types of PBT instruments.
- Describe the effectiveness of PBT's for drinking-driving enforcement.

Requirements

Suggested Illustrations

Statistics relating PBT's to increase in arrests.

Statistics relating PBT's to decrease in average BAC of arrests.

Statistics concerning PBT accuracy and reliability.

References

Evaluation of Screening Breath Testing in Traffic Law Enforcement. Dunlap and Associates, Inc., 1977.

Evaluation of Portable Breath Test Devices for Screening Suspected Drunken Drivers by Police in Hennepin County, Minnesota. Hennepin County Alcohol Safety Action Project, 1974.

Preliminary Evaluation of Portable Breath Test Devices for Pre-Arrest Testing in the South Dakota ASAP. South Dakota Alcohol Safety Action Project, 1974.

Final Evaluation of the Portable Pre-Arrest Testing Device in North Dakota. Safety Management Institute, 1975.

Evaluation of the National Highway Traffic Safety Administration Alcohol Screening Device. New York State Police, 1975.

Instructor Tasks

Instructor must familiarize himself thoroughly with the structure and contents of this unit. The unit comprises the following segments:

1. Introduction.
2. Types of PBT instruments.
3. PBT effectiveness.
4. Review and summary.

The segment "PBT Effectiveness" accounts for the majority of the time to be devoted to this unit. That segment is intended to enhance the trainees' motivation to use the PBT by acquainting them with the benefits that PBT's have been found to produce for drinking-driving enforcement.

The lesson plans for that segment cite findings drawn from field tests of PBT's in various States and localities. These findings relate to the facts that:

1. PBT's have helped to increase drinking-driving arrests.
2. PBT's have helped to reduce the average BAC of drinking-driving arrests.
3. PBT's have proved to be reasonably accurate and reliable in the field.
4. Police officers generally have accepted PBT's very well.

The instructor should become familiar with these findings, and strive to present them in a way that will enhance trainees' credence in the benefits of PBT's. To the maximum extent possible, the instructor should augment these findings with information obtained from the trainees' own State and department. If the State and/or department has been using PBT's for a reasonable period of time, *local* statistics concerning arrest rate, average BAC of arrest, and PBT accuracy, reliability, and acceptability should be

available. Locally obtained findings very likely will be more relevant and credible to trainees than would be information drawn from other States' experience.

Instructor must obtain or prepare all visuals and other instructional aids specified in the lesson plans. He should feel free to augment these with additional instructional aids that he feels will enhance learning.

Instructor should review the unit references and be prepared to use the references plus his own knowledge and experience to enrich the lesson plans as appropriate.

Unit 4 – Notes

Unit 4 – Contents

Introduction

Unit Title and Objectives

- Unit Title—"PBT Equipment"
- Unit Objectives
  - Identify and describe general types of PBT instruments.
  - Describe effectiveness of PBT instruments in drinking-driving enforcement.

Unit Content

- Introduction to two general classes of PBT instruments.
- Presentation of information describing how these instruments have affected drinking-driving enforcement.

Types of PBT Instruments

Preliminary breath testing devices are of two basic functional types.

- Disposable chemical reagent instruments.
- Reusable electronic instruments.

Disposable types of PBT instruments consist of two major parts, or components.

- Plastic or glass tube containing a chemical that reacts with alcohol.
  - The reaction changes the color of the chemical.
  - Amount of alcohol present determines how much color change occurs.
- The other major component is a balloon or inflatable plastic bag.
  - Balloon/bag permits a fixed amount of the suspect's breath to be collected and passed through the chemical tube.
  - Disposable PBT instruments often are referred to as "balloon tests."

Unit 4 – Notes

Unit title on chalkboard.

Refer trainees to unit objectives in Trainee Instructional Manual.

Relate unit content to objectives.

Display types on chalkboard.

Display the two parts on chalkboard.

Ask trainees why it is necessary to obtain a fixed amount of suspect's breath.

Reusable types of PBT instruments employ electric or electronic components to detect alcohol.

- Most types convert the alcohol directly or indirectly into some form of electric output (i.e., voltage, current, resistance, etc.) by means of a fuel cell or a semiconductor.
- The analytic processes used in reusable PBT instruments are similar to those employed by some evidentiary breath testing devices.

There are advantages and disadvantages associated with both types of PBT instruments.

- Disposable devices usually are relatively inexpensive, require no power source, need not be calibrated by the user, and can be kept in storage for long periods.
- Reusable devices are more accurate, do not require the user to interpret the result (i.e., he does not have to judge how much color change has occurred), and may be less cumbersome to use.
  - If the instrument is used often enough, the cost-per-test of a reusable instrument may be less than the cost of a disposable instrument.
- The most important point is that if the instrument is operated properly, both disposable and reusable devices will:
  - Be reasonably accurate for prearrest screening purposes.
  - Help to improve drinking-driving enforcement.

PBT Effectiveness

PBT instruments have been used by many law enforcement agencies with good results.

- Agencies using these instruments generally have found that their drinking-driving enforcement was substantially improved.
  - Number of arrests increased.
  - Average BAC of suspects arrested decreased.
- PBT instruments also have been found to work well in the field.
  - Instruments proved to be reasonably accurate.
  - Experienced relatively few breakdowns in the field.
- PBT instruments were well accepted by the police officers who used them.
  - Officers found PBT instrument to be a valuable tool.
  - Willing to continue to use the instruments.

Unit 4 – Notes

Write "electric/electronic detectors" on chalkboard.

In particular, these instruments usually collect a fixed amount of breath automatically.

Emphasize this last point.

Display these two areas of improvement on chalkboard.

Write "accurate and reliable" on chalkboard.

Write "well accepted by officers" on chalkboard.

Review of PBT Field Experience: Impact On Arrest Rate

- In Hennepin County, Minnesota, drinking-driving arrests increased by 62% after PBT instruments went into use.
- Six municipal departments in South Dakota reported a 70% increase in arrests after using PBT instruments.
- New York State Police made 46% more arrests following use of PBT instruments.
- Alabama Highway Patrol made 19% more arrests in a 1-year field test of PBTs.
- Highway patrol districts and municipal departments in Mississippi reported 20% more arrests during the same 1-year field test.
- Local statistics.
- Overall implication is that arrests have increased sharply after PBT's have gone into use.

Review of PBT Field Experience: Impact On BAC of Arrest

- Hennepin County, Minnesota:
  - Average BAC of suspects arrested without use of PBT: 0.179%.
  - Average BAC of suspects arrested with use of PBT: 0.14%.
- New York State Police reported that average BAC of arrest dropped from 0.19% to 0.14% in one district where PBT's were used.
- North Dakota Highway Patrol reported that average BAC of arrest decreased from 0.183% to 0.174% after PBT's went into use.
- Alabama Highway Patrol:
  - Average BAC of arrests made by officers having PBT's: 0.14%.
  - Average BAC of arrests by officers not having PBT's: 0.159%.
- State, county and local law enforcement agencies in Nebraska:
  - Average BAC of arrests made by officers having PBT's: 0.187%.
  - Average BAC of arrests by officers not having PBT's: 0.199%.
- Local statistics.
- Overall implication is that PBT's have helped officers to detect and apprehend drinking-driving violators who are at lower BAC.

Unit 4 – Notes

Display visual indicating how PBT's have been associated with increased arrests.

If available.

Display visual indicating how PBT's have been associated with reduction of average BAC of arrest.

If available.

Review of PBT Field Experience: PBT Accuracy and Reliability.

- In a 1-year field study sponsored by U.S. Department of Transportation:
  - No suspect who "failed" the PBT had BAC below 0.05%.
  - Only 3.7% of suspects who "failed" had BAC between 0.05-0.09%.
- In a Tampa, Florida roadside survey program, only 17% of individuals with BAC's between 0.05-0.09% "failed" the PBT.
  - In the same program, only 4% of individuals with BAC's between 0.10-0.14% did not "fail" the PBT's.
- In the 1-year field study:
  - About 75% of participating officers agreed that PBT's almost always work properly.
  - Only about 15% reported their PBT's had malfunctioned.
- In Hennepin County, PBT reliability was rated "high" in a 5-month field test.
- Local statistics.
- Overall implication is that PBT instruments are reasonably accurate and reliable for prearrest screening purposes.

Review of PBT Field Experience: Acceptability of PBT Devices.

- Officers participating in U.S. Department of Transportation's 1-year field study accepted PBT's very well.
  - Approximately 65% considered PBT's to be very useful.
  - More than half believed PBT's improved their ability to determine whether suspect is under the influence.
  - Approximately 75% considered PBT's to be a good idea for drinking-driving enforcement.
- Suspects usually cooperate with a request to take the PBT test.
  - Only 11% of suspects refused the test during the 1-year field study.
- Overall implication is that PBT's are worthwhile tools for drinking-driving enforcement.

Unit 4 – Notes

Display visual indicating PBT accuracy and reliability.

If available.

Unit 4 – Contents

Review and Summary

Two Basic Functional Types of PBT are:

- Disposable (chemical reagent).
- Reusable (electronic).

Use of PBT's has produced two major benefits for drinking-driving enforcement:

- Increase of arrests.
- Decrease of average BAC of arrest.

Where they have been used, PBT's generally have proved to be:

- Reasonably accurate.
- Reasonably reliable.
- Well accepted by officers.

Unit 4 – Notes

Ask trainees to name the two types.

Ask trainees to state benefits.

Solicit trainees' questions concerning the contents of this unit.

Unit 5
PBT Operation

Time:
Two hours and
10 minutes

Objectives

Provide the trainee with sufficient information for him to:

- Identify the PBT(s) used by his department.
- Identify and describe the major components of the instrument(s) and the function of each component.
- Describe the instrument's operating procedures (and its inspection and calibration procedures, if applicable).

Provide the trainee with sufficient hands-on practice on the instrument(s) for him to acquire skill in applying the operating procedures.

Requirements

Handout Material

- Practice segment schedule assignments for each trainee team.
- Recording forms for practice test results.

Suggested Illustrations

- Picture or accurate sketch of (each) PBT instrument.
- List of major components of (each) instrument.
- Operating procedures of (each) instrument.
- Battery replacement procedures (if applicable).
- List of equipment required for instrument calibration (if applicable).
- Calibration procedures (if applicable).

Equipment and Materials

PBT Instruments

- Two units of (each) instrument for instructor.
- At least one unit for every two trainees.

(Note: If the PBT instrument is of the disposable type, instructor will require approximately 6 units, and each trainee approximately 10 units.)

Mouthpieces

- At least six for the instructor.
- Ten to fifteen for each trainee.

Breath Alcohol Simulators

- Approximately five, set for various BAC equivalents.

Spare Batteries/Battery Packs (if applicable)

- At least three.

Battery Chargers (if applicable)

- One for each PBT unit.

Screwdrivers and other tools needed for calibration/adjustment (if applicable)

- At least two of each such tool.

Alcohol mouth spray for test demonstration purposes.

Personnel

- Instructor.
- Instructor's aides.

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- At least one aide is desirable under all circumstances.
- At least one aide is essential if there are more than 16 trainees.
- Another aide must be assigned exclusively to escort/supervise volunteer drinking subject(s) (if applicable).

- Volunteer drinking subject(s).
  - Desirable to provide realistic practice, but not absolutely essential.
  - If volunteer drinking subjects are used, there should be at least one for every eight trainees, and sufficient quantity of alcohol for their consumption must be provided.
  - If volunteers are used, would be beneficial to conduct *both* evidentiary and PBT testing.

References

Operating and maintenance manual for (each) PBT instrument.

Instructor Tasks

The Instructor's first task is to familiarize himself thoroughly with the structure and contents of this unit. The unit is subdivided into the following segments:

1. Introduction.
2. General description of PBT instrument.
3. Instrument features and operating principles.
4. Test requirements and operating procedures.
5. Inspection and calibration procedures (applicable only to reusable PBT instruments).
6. Trainee practice.

A separate set of lesson plans for the first five segments has been prepared for each of several different PBT instruments. The lesson plans for the final segment apply to any PBT instrument.

The instructor must select the set(s) of lesson plans corresponding to the instrument(s) used by the trainees' department. In the event that the department employs an instrument that was not commercially available at the time that this course was developed, *the instructor must prepare an appropriate set of lesson plans.*

The instructor must select the modalities that will be used for the trainee practice segment. The lesson plans provided for that segment call for using four types of practice modalities:

1. Dry runs, i.e., trainees administer PBT tests to other trainees.
2. Breath alcohol simulator tests, using simulators with BAC equivalents known by trainees.
3. Breath alcohol simulator tests, using simulators with BAC equivalents unknown to trainees.
4. Volunteer drinking subjects, i.e., trainees administer PBT tests to individuals who have consumed controlled quantities of alcohol.

All four modalities are considered highly desirable. If all four are used, they will help ensure that trainees develop PBT operating skills under conditions of increasing realism. However, if necessary due to limitations of budget, personnel resources, etc., the instructor might elect to dispense with volunteer subjects and/or unknown BAC simulator tests. In such case, additional practice must be provided using the remaining modalities or other suitable modalities. If volunteer drinking subjects are to be used, the instructor should familiarize himself thoroughly with the guidelines for controlled drinking sessions presented in Appendix A of this Manual.

Once practice modalities have been selected, the instructor must develop a detailed practice schedule. The schedule must define precisely what each team (pair) of trainees will be doing at any given time during the practice segment. At the very least, the schedule must provide each trainee with an opportunity to conduct a minimum of five PBT tests and to observe a minimum of five tests conducted by other trainees. A sample practice schedule is included in the lesson plans for the Trainee Practice segment.

The instructor must obtain or prepare all visuals, handout materials, and other instructional aids specified in the lesson plans. He should feel free to augment these with additional instructional aids that he feels will enhance learning.

The instructor must obtain all equipment and materials called for in the lesson plans. He must ensure that all such equipment is in proper working order and is properly prepared for use in the unit. Specific instructor responsibilities apply to the PBT instruments and the breath alcohol simulators.

a. Each PBT instrument must be carefully checked to verify that it is properly calibrated and that its batteries are fully charged. (These requirements do not apply to disposable types of PBT instruments.)

b. Simulators must be prepared to supply the desired BAC equivalents. It is recommended that one simulator be set at the BAC level used for calibrating the PBT "fail" indicator; two other simulators should be set at somewhat higher levels, two others at lower values. Each simulator should be uniquely labeled to facilitate its use during practice (letter designations, e.g., "A," "B," etc., would suffice). Each simulator must be carefully checked to ensure that it is in proper working order.

The instructor must ensure that he is thoroughly familiar with the operation, inspection, and calibration of the PBT instrument.

If the trainees' department wishes them to be certified as PBT *calibrators* as well as operators, an additional practice segment must be added to the unit. The instructor must develop the plans and procedures for this segment.

The instructor should review the unit references and be prepared to use the references plus his own knowledge and experience to enrich the lesson plans as appropriate.

Unit 5.1 – Contents

Introduction

Unit Title and Objectives

- Unit Title—"PBT Operation—ALERT Model J3A"
- Unit Objectives
  - Identify PBT used by department.
  - Identify and describe instrument components and their functions.
  - Describe procedures for operating, inspecting, and calibrating the instrument.
  - Practice instrument operation.

Unit Content

- Introduction to the ALERT preliminary breath testing device (Model J3A).
- Familiarization with the operating principles of the ALERT, its major components, and design features.
- Presentation and demonstration of procedures for operating, inspecting, and calibrating the ALERT.
- Practice conducting preliminary breath tests using the ALERT.
  - Each trainee will have an opportunity to conduct at least ____ tests on the ALERT.
  - Trainees will practice in ____ member teams.

ALERT Model J3A: General Description

ALERT is a reusable preliminary breath testing device.

- "ALERT" is acronymn for "alcohol-level-enforcement-road-tester."
- Instrument weighs approximately 2½ pounds and is easily held in one hand.
- Operation is largely automatic; hence, operating procedures are relatively simple.

Instrument Features and Operating Principles

Analytic Principle. **ALERT employs a solid-state semiconductor detector.**

- Alcohol increases the electric conductance of the semiconductor.
- Increased conductance is proportionate to the concentration of alcohol present.
- The higher the BAC, the greater will be the voltage output of the detector.

Unit 5.1 – Notes

Unit title on chalkboard.

Refer trainees to unit objectives in the Trainee Instructional Manual.

Relate unit content to objectives.

As per procedures for the practice segment of this unit.

Display picture or accurate sketch of ALERT J3A via visual.

Demonstrate ease of holding.

Write "solid-state semiconductor detector" on chalkboard.

Test results are indicated by *PASS, WARN, FAIL* display lamps.

- Minimum voltage required to light FAIL lamp is established during calibration.
- Establishing minimum voltage for FAIL lamp is equivalent to selecting BAC level for FAIL (FAIL threshold). In other words, we can set the threshold so that the FAIL lamp will light at any BAC we desire.
- Calibrating FAIL lamp automatically calibrates WARN and PASS lamps as well.
- Minimum BAC for WARN automatically is one-half minimum BAC for FAIL.
- Any BAC less than one-half the minimum for FAIL will light PASS lamp.

Major Components

- Internal components include:
  - Semiconductor (alcohol detector).
  - Breath pressure switch.
  - Timer.
  - Heater unit.
  - Batteries (three "C" size nickel cadmium).
- External components include:
  - START switch.
  - Status lamps (ON, READY, TEST).
  - Test result lamps (PASS, WARN, FAIL).
  - Calibration adjustment screw.
  - RESET switch.
  - Charging connector.
  - Breath intake port.

Component Functions and Characteristics

- START switch activates the instrument.
  - Turns on the ON lamp.
  - Begins to heat the semiconductor detector.
- Heater unit brings temperature of detector up to 350°C.
  - Temperature helps to eliminate any residual alcohol from previous test and prepares detector for the next test.

Unit 5.1 – Notes

Example: *If 0.10% is minimum BAC for FAIL, 0.05% will be minimum BAC for WARN.* Note: *Other FAIL:WARN ratios are available from manufacturers. Check to verify ratios of department's instruments.*

Display major components via chalkboard or visual.

Indicate that primary emphasis in this unit will be devoted to external components.

Point out location of each external component.

Demonstrate START switch function.

- Approximately 2 minutes required to reach this temperature.
- ON lamp indicates that instrument is in an operable condition.
  - If ON lamp does not light or flashes, batteries require charging.
- READY lamp indicates that temperature has been reached.
  - Signifies that instrument is ready for test.
- TEST lamp lights when suspect blows into the instrument.
  - Suspect must blow hard enough to trip the pressure switch.
  - Suspect must blow continuously for approximately 6 seconds, until both TEST and READY lights go out.
  - If suspect does not blow hard enough, or stops blowing prematurely, TEST and READY lights extinguish.
- PASS, WARN, or FAIL lamp lights at the completion of a valid test.

Test Requirements and Operating Procedures

Mouthpiece and mouthpiece adapter required for a test

- Insert adapter into breath intake port.
- Affix mouthpiece to adapter.

Basic operating procedures

- Press START switch.
  - Observe that ON lamp lights steadily.
  - Wait until READY lamp illuminates.
- Instruct suspect that he will be required to blow moderately hard and steadily into the mouthpiece.
- Hold instrument toward suspect and instruct him to start blowing and to continue to do so until you tell him to stop.
  - Verify that TEST and READY lamps are on continuously as suspect blows into instrument.
  - Ensure that TEST lamp does not extinguish while suspect is blowing.
  - When both TEST and READY lamps extinguish (after approximately 6 seconds), instruct suspect to stop blowing.
  - Remove and discard mouthpiece.

Unit 5.1 – Notes

If READY lamp does not light, proper temperature may not be reached and test must not be given.

Pressure switch and 6-second timer designed to assure that suspect provides deep-lung breath.

Demonstrate interrupted test.

Demonstrate valid test.

Display mouthpiece and adapter. Demonstrate installation of adapter and mouthpiece.

Display operating procedures via visual or chalkboard.

Remind trainees that flashing or unlit ON lamp indicates batteries require recharging. Emphasize that test must not be conducted if READY lamp is unlit.

Emphasize that instrument must not be handed over to suspect.

- Observe test result lamps (PASS, WARN, FAIL) and note which one illuminates.
- Return START switch to off position.

- If TEST lamp extinguishes prematurely while test is in process, instruct suspect to stop blowing.
  - Remove and discard mouthpiece.
  - Affix fresh mouthpiece to adapter.
  - Wait for READY lamp to relight.
  - Reinstruct suspect to blow moderately hard and steadily.
  - Repeat test.

Demonstrations of operating procedures

- Instructor demonstration/dry run:
  - Instructor conducts test on himself.
- Instructor demonstration/mouth alcohol spray:
  - Instructor uses breath spray to create residual mouth alcohol condition.
  - Instructor conducts test on himself:
- Instructor demonstration/trainee subject.
  - Instructor recruits trainee to serve as test subject.
  - Instructor conducts test on trainee.
- Trainee demonstration:
  - Instructor recruits two trainees, one to serve as test conductor, one as test subject.

Inspection and Calibration Procedures

Principal inspection tasks are to check batteries and to check display lamps.

- Battery status is indicated by the ON lamp.
- A separate battery charger unit is needed to restore batteries to operational condition.
  - Plug charger unit into a source of 115 volts AC power (50–60 cycle).

Unit 5.1 – Notes

Fresh mouthpiece is needed because the original mouthpiece might be contaminated by residual alcohol.

Verbalize operating steps during instructor demonstrations.

Delay test for approximately 30 seconds following use of mouth spray.

Mouth spray may be used by trainee test subject.

Have test conductor verbalize operating steps.

Remind trainees of significance of unlit or flashing ON lamp.

Display charger unit and demonstrate charging procedures.

- Plug charger unit into the charging connector port on the instrument.
- Ten to 12 hours are normally required to obtain a full charge.
- If the instrument is exposed to very low temperatures (below 0°C) for many hours, longer and more frequent charging may be needed.

- If the instrument provides fewer than 10 tests after a full charge, batteries should be replaced.
- Battery pack replacement procedures.
  - Mark new battery pack with replacement date.
  - Remove four screws from battery pack panel.
  - Remove old battery pack and disconnect the connector.
  - Connect new battery pack and replace in the instrument.
  - Replace the four screws.
  - Mark or discard old battery pack.
  - Press START switch to verify that new battery pack is installed and operating properly.
- Display lamps can be checked by means of the RESET switch.
  - Holding the RESET switch in acts as a lamp test.
  - All status lamps (ON, READY, TEST) and all test result lamps (PASS, WARN, FAIL) should illuminate when RESET switch is held in.

Calibration is the process of establishing the minimum BAC that will cause the FAIL lamp to illuminate ("FAIL threshold").

- Equipment needed for calibration:
  - Breath alcohol simulator (alcohol/water type).
  - Simulator solution of the desired BAC equivalent.
  - Screwdriver compatible with the calibration adjustment screw.
  - Plastic moisture trap-type mouthpiece and plastic tubing to connect simulator to the instrument.
- Calibration procedures—preparatory steps:
  - Prepare and turn on simulator.
  - Verify that simulator is at proper operating temperature.
  - Press ALERT START switch.
  - Wait for READY lamp to light.
  - Connect simulator outlet to ALERT breath intake port via plastic tubing and moisture trap.

Unit 5.1 – Notes

Emphasize that ALERT can and should be charged constantly when not in use (no danger of overcharging).

Display battery pack replacement procedures via chalkboard or visual.

Demonstrate replacement procedures.

Demonstrate lamp test function of RESET switch.

Display equipment needed.

Display calibration procedures via chalkboard or visual.

Moisture trap prevents liquid from entering the instrument.

- Blow continuously through simulator into ALERT, verifying that TEST lamp is steadily lit.
- Cease blowing when TEST and READY lamps extinguish.
- Observe test result lamps (PASS, WARN, FAIL) and note which one illuminates.

- Calibration adjustment Case 1:
  FAIL lamp illuminates after simulator test.
  - Turn calibration adjustment screw several turns *counterclockwise*, using screwdriver.
  - Push and release RESET switch.
  - If FAIL lamp remains on, turn adjustment screw several additional turns *counterclockwise* and push and release RESET switch.
  - When WARN lamp illuminates, *slowly* turn adjustment screw *clockwise*.
  - Stop turning immediately when FAIL lamp reilluminates.
- Calibration adjustment Case 2:
  PASS or WARN lamp illuminates after simulator test.
  - *Slowly* turn adjustment screw *clockwise*, using screwdriver.
  - Stop turning immediately when FAIL lamp illuminates.

- Calibration check should be performed once every ____(days, weeks, etc.).

Unit 5.1 – Notes

Repeat, as needed, until FAIL extinguishes and WARN illuminates.

Demonstration of calibration procedures. (Instructor demonstration)

As per departmental policy and standard procedures.

Unit 5.2 – Contents

Introduction

Unit Title and Objectives

- Unit Title—"PBT Operation—Alco-Sensor"
- Unit Objectives
  - Identify PBT used by department.
  - Identify and describe instrument components and their functions.
  - Describe procedures for operating, inspecting, and calibrating the instrument.
  - Practice instrument operation.

Unit Content

- Introduction to the Alco-Sensor preliminary breath testing device.
- Familiarization with the operating principles of the Alco-Sensor, its major components, and design features.
- Presentation and demonstration of procedures for operating, inspecting, and calibrating the Alco-Sensor.
- Practice conducting preliminary breath tests using the Alco-Sensor.
  - Each trainee will have an opportunity to conduct at least ____ test on the Alco-Sensor.
  - Trainees will practice in ____ member teams.

Alco-Sensor: General Description

Alco-Sensor is a reusable preliminary breath testing device.

- Instrument weighs approximately 5 ounces and can easily be held in one hand.
- Operating procedures are relatively simple and straightforward.

Instrument Features and Operating Principles

Analytic Principle. **Alco-Sensor employs a fuel cell (electrochemical cell) detector.**

- Cell membrane absorbs alcohol and converts it to an electric current.
- Amount of current generated is proportionate to the concentration of alcohol present.
- The higher the BAC, the greater will be the current output of the fuel cell.

Unit 5.2 – Notes

Unit title on chalkboard.

Refer trainees to unit objectives in Trainee Instructional Manual.

Relate unit content to objectives.

As per procedures for the practice segment of this unit.

Display photograph or accurate sketch of Alco-Sensor via visual.

Demonstrate ease of holding.

Test results are displayed by *ZERO, PASS, WARN, FAIL* indicator lights.

- Minimum current output required to illuminate FAIL light is established during calibration.
- Establishing minimum current for FAIL light is equivalent to selecting BAC level for FAIL ("FAIL threshold"). In other words, we can set the threshold so that "FAIL" will light at any BAC we desire.
- Calibrating FAIL light automatically establishes WARN range as well.
- Minimum BAC for WARN automatically is 20% below minimum BAC for FAIL.
- ZERO light is set to illuminate if BAC is less than 0.01%.
- Any BAC between 0.01% and the "WARN threshold" will illuminate the PASS light.

Major Components

- Internal components include:
  - Fuel cell (alcohol detector).
  - Breath sampling valve.
  - Battery (22½ volts).
- External components include:
  - Temperature display.
  - SET pushbutton.
  - READ pushbutton.
  - LIGHT display (ZERO, PASS, WARN, FAIL, and battery status indicator).
  - Breath intake port.
  - Calibration adjustment screw.
  - ZERO adjustment screw.

Component Functions and Characteristics

- Temperature display indicates temperature of fuel cell.
  - Most efficient operating range is 26-36°C.
  - Instrument will operate at lower temperature but accuracy is reduced and response is sluggish.
  - Instrument contains no heater; temperature depends on ambient conditions or external heat source.

Unit 5.2 – Notes

i.e., we can set the threshold so that "FAIL" will light at any BAC we desire.

Example: *If 0.10% is minimum BAC for FAIL, then WARN range will be 0.08–0.10%.*

Note: *Other FAIL:WARN ratios are available from manufacturer. Check to verify ratios of department's instruments.*

Display major components via visual or chalkboard.

Indicate that primary emphasis in this unit will be on external components.

Point out location of each external component.

Point out that instrument can be kept at proper operating temperature by carrying it in an inside breast pocket, by keeping it inside a heated patrol vehicle, or by various other means.

- SET pushbutton electrically "shorts" the fuel cell.
  - Accelerates elimination of any residual alcohol from previous test.
- SET pushbutton also cocks the breath sampling valve.
  - Valve must be cocked in preparation for a test.
- READ pushbutton operates in two stages.
  - Releases the breath sampling valve, thus drawing 1 cc of breath/air into the fuel cell.
  - Turns the instrument "on" electrically, thus enabling analysis of the breath sample and display of test results.
- READ pushbutton also enables check of battery condition.
  - Battery status indicator should light whenever READ pushbutton is depressed.
  - Failure of indicator to light signifies that battery needs replacement.
- ZERO, PASS, WARN, or FAIL lamps light after completion of a test.
  - Test result is "highest" lamp that lights.

Test Requirements and Operating Procedures

Mouthpiece required for each test.

- Affix mouthpiece to breath intake port.
  - Make sure mouthpiece snaps securely into place.
  - Align mouthpiece for convenience of suspect and operator.

Basic Operating Procedures

- Depress SET pushbutton and place Alco-Sensor in pocket for 5 to 10 minutes.
  - Make sure SET pushbutton holds in down position.
  - This step should be taken when first approaching the suspect.
  - Five- to ten-minute preparation period is desirable, but may not be necessary in every case.
- Observe temperature display and verify that temperature is between 26–36°C.
  - If temperature is too low, return instrument to pocket or other heat source for additional warm up.
  - If temperature is too high, expose instrument to outside air and wait until it is properly cooled.
- Press and hold down READ pushbutton for 10 seconds.
  - Verify that SET pushbutton is released when READ is depressed.

Unit 5.2 – Notes

Operator must press READ pushbutton while suspect is blowing into mouthpiece in order to obtain sample of suspect's breath.

Point out location of battery status indicator in center of light display.

Display mouthpiece and demonstrate its installation. Remove mouthpiece after demonstration.

Display operating procedures via visual or chalkboard.

This step enables elimination of any residual alcohol from previous test and helps to bring instrument to proper operating temperature.

Step will not be needed if instrument is at proper temperature and any residual alcohol has been eliminated.

Test must not be taken if SET does not release or if battery status indicator is extinguished.

- Verify that battery status indicator remains lit when READ is depressed.
- Verify that ZERO light remains lit when READ is depressed.

- If ZERO light does not remain on for 10 seconds with READ pushbutton depressed:
  - Re-depress SET pushbutton and return instrument to pocket.
  - After several minutes, re-check ZERO by depressing and holding READ for 10 seconds.
  - If ZERO still does not remain on for 10 seconds with READ depressed, manually readjust ZERO setting.
- Once valid ZERO check has been made, depress SET pushbutton and mount mouthpiece on breath intake port.
- Instruct suspect that he will be required to blow hard and steadily for as long as possible.
- Hold instrument toward suspect and instruct him to start blowing and to continue to do so until you tell him to stop.
  - Listen to sound of breath passing through mouthpiece to verify that suspect is providing valid breath sample.
  - Hold thumb above READ pushbutton in preparation for obtaining a breath sample.
  - Closely observe suspect for indications that he is nearing the end of his exhalation.
- Near the end of the suspect's exhalation, momentarily depress READ pushbutton.
  - Instruct suspect to stop blowing.
  - Remove and discard mouthpiece.
  - Wait 5 seconds to allow for absorption of alcohol by the fuel cell membrane.
- Depress and hold READ pushbutton for 60 seconds.
  - Closely observe light display.
  - Note which test result light (or lights) comes on.
  - Test result is "highest" light that illuminates.
- Depress SET pushbutton to accelerate elimination of residual alcohol.

Demonstrations of Operating Procedures

- Instructor demonstration/dry run:
  - Instructor conducts test on himself.
- Instructor demonstration/mouth alcohol spray:
  - Instructor uses breath spray to create residual mouth alcohol condition.
  - Instructor conducts test on himself.

Unit 5.2 – Notes

Primary purpose of this step is to check for a valid ZERO reading.

Re-depressing SET provides additional time for elimination of residual alcohol from previous test.

Procedures for adjusting ZERO setting are presented later in this unit.

Breath sampling valve is cocked, and instrument is ready for test.

Emphasize that instrument must not be handed over to suspect.

Point out that most suspects will be able to supply at least 8–10 seconds of breath.

This step collects 1 cc of suspect's breath.

Point out that during the 60 seconds, more than one test result light may illuminate as the current output of the fuel cell increases and decreases as the alcohol is consumed.

Verbalize operating steps during instructor demonstrations.

Delay test for approximately 30 seconds following use of mouth spray.

- Instructor demonstration/trainee subject:
  - Instructor recruits trainee to serve as test subject.
  - Instructor conducts test on trainee.
- Trainee demonstration:
  - Instructor recruits two trainees, one to serve as test conductor, one as test subject.

Inspection, Adjustment and Calibration Procedures

Principal inspection tasks are to check operation of SET and READ pushbuttons, check temperature displays, and check battery status.

- Depress SET and READ pushbuttons.
  - SET should hold in down position when depressed.
  - SET should release when READ is depressed.
- Place instrument in a controlled temperature environment for approximately 20 minutes.
  - Controlled temperature should be between 26 and 36°C (approximately 79-97°F).
  - At the end of the period, instruments temperature display should show 26-36°C.
- Check battery by depressing and holding READ pushbutton.
  - Battery status indicator should remain lit with READ depressed.
  - If indicator is extinguished, battery needs replacement.
- Battery replacement procedures:
  - Mark new battery with replacement date.
  - Slide BATTERY DOOR open.
  - Remove old battery.
  - Observe polarity markings on BATTERY DOOR.
  - Insert new battery.
  - Close BATTERY DOOR.
  - Mark or discard old battery.
  - Depress READ pushbutton and observe battery status indicator light to verify that new battery is installed and operating properly.

ZERO adjustment is the process of ensuring that a blank (alcohol-free) sample will illuminate the ZERO light.

- Instrument must be prepared for a ZERO check/adjustment by maintaining it at operating temperature with SET pushbutton depressed for at least 10 minutes.

Unit 5.2 – Notes

Mouth spray may be used by trainee test subjects.

Have test conductor verbalize operating steps.

Use an accurate centigrade thermometer to compare the temperature.

Display battery replacement procedures via chalkboard or visual.

Demonstrate replacement procedures.

Ensures elimination of any residual alcohol from previous test.

- After proper preparation, check ZERO by depressing and holding READ pushbutton for 10 seconds.
  - Observe ZERO light.
  - If ZERO light remains on for the full 10 seconds, instrument does not require ZERO adjustment.
  - If ZERO light extinguishes or remains off during the 10 seconds, adjustment is needed.
- ZERO adjustment procedures:
  - Depress and hold down READ pushbutton continuously during adjustment.
  - Wait 10 seconds.
  - Using compatible screwdriver, turn ZERO adjustment screw *counterclockwise* until PASS light just comes on.
  - Turn ZERO adjustment screw *clockwise* until ZERO light just comes on.
  - Turn screw an additional one-quarter turn *clockwise*.
  - Depress SET pushbutton and wait 20 seconds.
  - Re-check ZERO by depressing and holding READ pushbutton for 10 seconds.

Calibration is the process of establishing the minimum BAC that will cause the FAIL light to illuminate ("FAIL THRESHOLD").

- Equipment needed for calibration:
  - NALCO Standard breath alcohol simulator set for desired BAC equivalent.
  - Screwdriver compatible with the calibration adjustment screw.
  - Standard Alco-Sensor mouthpiece.
  - Short plastic tubing for connecting NALCO Standard to mouthpiece.
- Calibration procedures—preparatory steps:
  - Make sure that Alco-Sensor has not been used for 2 hours.
  - Maintain instrument at proper operating temperature with SET pushbutton depressed for at least 15 minutes.
  - **Depress READ and verify that ZERO is set properly.**
  - **Affix mouthpiece to the instrument.**
  - Re-depress SET pushbutton.
  - Using short plastic tubing, connect NALCO Standard to the *short end* of the mouthpiece.
  - Deliver simulator sample by depressing pressure valve on NALCO Standard; allow flow to continue for several seconds.
  - While flow is continuing, momentarily depress READ pushbutton.

Unit 5.2 – Notes

Depressing READ introduces 1 cc of outside air into fuel cell.

Display and demonstrate ZERO adjustment procedures.

This step is not necessary if PASS light is already on.

Repeat adjustment procedures if ZERO light does not remain lit for full 10 seconds.

Display equipment needed.

Display calibration procedures via visual or chalkboard.

First step not necessary if instrument was used for fewer than five tests in the past hour.

Hold for 10 seconds and verify that ZERO stays lit.

Ensure that connection is airtight.

Introduces 1 cc of simulator gas into fuel cell.

- Cease simulator flow and remove mouthpiece from instrument.
- Depress READ pushbutton and hold for 60 seconds while observing test result lights.

- Calibration Adjustment Case 1:
  FAIL light does not illuminate during the 60 seconds.
  - If only PASS light illuminated, turn calibration adjustment screw at least one full turn *counterclockwise*.
  - If WARN light illuminated, turn calibration adjustment screw at least one-half turn *counterclockwise*.
  - After turning the adjustment screw, repeat the preparatory steps described previously.
- Calibration Adjustment Case 2:
  FAIL light illuminates subsequent to simulator test.
  - When FAIL light comes on, immediately turn calibration adjustment screw *clockwise* just enough to turn FAIL off and WARN back on.
  - FAIL light should come back on; if it does, again turn screw *clockwise* (very slightly) just to turn FAIL off and WARN back on.
  - If FAIL light does not come back on after the first screw adjustment, the instrument is not calibrated. The entire set of calibration procedures must then be repeated.
- Proper calibration will result in a WARN light at the specified BAC, and a FAIL light at any higher BAC.
- Calibration check should be performed once every _____ (days, weeks, etc.).

Unit 5.2 – Notes

Continue process until simulator test produces a FAIL result.

This sequence might occur more than once. Each time FAIL comes back on, screw must immediately be turned clockwise just enough to turn WARN back on. Process is to be continued until FAIL light does not come back on.

Example: If instrument is calibrated using a 0.10% simulator, a WARN light should result at BAC of 0.100%, a FAIL light at BAC of 0.101%.

Demonstration of calibration procedures.

As per departmental policy and standard procedures.

Unit 5.3 – Contents

Introduction

Unit Title and Objectives

- Unit Title—"PBT Operation—Alcolyser"
- Unit Objectives
  - Identify PBT used by department.
  - Identify and describe instrument components and their functions.
  - Describe procedures for operating, inspecting, and calibrating the instrument.
  - Practice instrument operation.

Unit Content

- Introduction to the Alcolyser preliminary breath testing device.
- Familiarization with the operating principles of the Alcolyser, its major components, and design features.
- Presentation and demonstration of procedures for operating Alcolyser.
- Practice conducting preliminary breath tests using the Alcolyser.
  - Each trainee will have an opportunity to conduct at least ____ tests on the Alcolyser.
  - Trainees will practice in ____ member teams.

Alcolyser: General Description

Alcolyser is a disposable preliminary breath testing device.

- Instrument is relatively simple in construction and easy to use.
- Requires very little preparation for use.

Unit 5.3 – Notes

Unit title on chalkboard.

Refer trainees to unit objectives in the Trainee Instructional Manual.

Relate unit content to objectives.

As per procedures for the practice segment of this unit.

Display picture or accurate sketch of Alcolyser via visual.

Unit 5.3 – Contents

Instrument Features and Operating Principles

Analytic Principle. **Alcolyser employs an alcohol-sensitive chemical.**

- Normal color of the chemical is yellow-orange.
- Alcohol changes the color of the chemical to green.
- The amount of the chemical that changes color is proportionate to the concentration of alcohol present.
- The higher the BAC, the more of the chemical changes color.

Test results are determined by observing or measuring the amount of chemical that changes color.

- The manufacturer has placed a fixed amount of the chemical in the tube.
- A red line appears on the tube at the midpoint of the chemical column.
- The red line indicates the length of color change that corresponds to the BAC "Fail Threshold."
- If the color change extends to or beyond the red line, the suspect is considered to have failed the test (BAC at or above threshold level).
- If the color change stops below the red line, the suspect is considered to have passed the test (BAC below threshold level).

Major components include:

- Glass tube containing the chemical column.
- Inflatable plastic bag for collecting breath sample.
- Mouthpiece.
- A glass cutter.

Test Requirements and Operating Procedures

Test requirements include all of the major components discussed above.

Unit 5.3 – Notes

Display a detailed sketch or picture of chemical column.

Indicate threshold level established for department's instruments.

Point out that actual BAC can be established by length of color change. Example: If threshold level is 0.10% and color change extends about halfway to red line, then BAC is approximately 0.05%.

Display major components via chalkboard or visual.

Test kit contains 10 tubes, 10 mouthpieces, one glass cutter, and one plastic bag. Bag is retained and used for all 10 tests.

Basic operating procedures:

- Using glass cutter, remove tapered ends of glass tube.
  - Tube is hermetically sealed to prevent contamination of chemical.
- Note red arrow printed on tube.
  - Arrow denotes prescribed direction of breath flow.
  - End toward which arrow points is to be inserted into the plastic bag.
- Insert proper end of tube into the entry port of the plastic bag.
- Insert the other end of the tube into the mouthpiece.
- Instruct suspect that he will be required to blow continuously through the tube until the bag is fully inflated.
  - Suspect should be instructed to take a deep breath immediately before blowing into the tube.
  - If necessary, suspect may take more than one breath to fill the bag, but filling the bag with a single breath is more desirable.
- Lightly hold the bag while permitting the suspect to hold the glass tube.
- Instruct suspect to start blowing and to continue to do so until you tell him to stop.
  - Make sure bag is completely unfurled.
  - Observe bag expansion.
  - When bag is completely filled, instruct suspect to stop blowing.
  - Remove tube from bag.
  - Exhaust air from bag, refold and retain for future use.
  - Observe color change in chemical column of tube and note test result.
  - Dispose of tube and mouthpiece.

Demonstrations of operating procedures:

- Instructor demonstration/dry run:
  - Instructor conducts test on himself.
- Instructor demonstration/mouth alcohol spray:
  - Instructor uses breath spray to create residual mouth alcohol condition.
  - Instructor conducts test on himself.

Unit 5.3 – Notes

Display operating procedures via visual or chalkboard.

Verify that seal is airtight.

Verify that seal is airtight.

If more than one breath is used to fill the bag, the proportion of deep-lung air in the breath sample will be reduced; test result then may be lower than actual BAC.

Do not *exhaust bag air back through the tube. It is possible that some alcohol fumes will be trapped in the bag.*

Complete reaction of alcohol with chemical may require 30–60 seconds.

Verbalize operating steps during instructor demonstration.

Delay test for approximately 30 seconds following use of mouth spray.

- Instructor demonstration/trainee subject:
  - Instructor recruits trainee to serve as test subject.
  - Instructor conducts test on trainee.
- Trainee demonstration:
  - Instructor recruits two trainees, one to serve as test conductor, one as test subject.
- Instructor demonstration/breath alcohol simulator:
  - Instructor conducts test using a breath alcohol simulator.

Unit 5.3 – Notes

Mouth spray may be used by trainee test subjects.

Have test conductor verbalize operating steps.

This demonstration serves to acquaint trainees with procedures for using the simulator.

Unit 5.4 – Contents

Introduction

Unit Title and Objectives

- Unit Title—"PBT Operation—Alco-Limiter Model 1100"
- Unit Objectives
  - Identify PBT used by department.
  - Identify and describe instrument components and their functions.
  - Describe procedures for operating, inspecting and calibrating the instrument.
  - Practice instrument operation.

Unit Content

- Introduction to the Alco-Limiter breath testing device (Model 1100).
- Familiarization with the operating principles of the Alco-Limiter, its major components and design features.
- Presentation and demonstration of procedures for operating, inspecting, and calibrating the Alco-Limiter.
- Practice conducting preliminary breath tests using the Alco-Limiter.
  - Each trainee will have an opportunity to conduct at least ____test on the Alco-Limiter.
  - Trainees will practice in ____member teams.

Alco-Limiter Model 1100: General Description

Alco-Limiter is a reusable breath testing device.

- The instrument weighs slightly less than 9 pounds and measures 6" × 6" × 11".
- Manufacturer has designed the instrument for use as either a preliminary breath tester or evidentiary breath tester.
- Operation is relatively simple and straightforward.

Unit 5.4 – Notes

Unit title on chalkboard.

Refer trainees to unit objectives in the Trainee Instructional Manual.

As per procedures for the practice segment of this unit.

Display picture or accurate sketch of Alco-Limiter 1100 via visual.

Emphasize that only its application to prearrest screening will be discussed in this course.

Unit 5.4 – Contents

Instrument Features and Operating Principles

Analytic Principle. **Alco-Limiter employs a fuel cell (electrochemical transducer) detector.**

- The cell oxidizes alcohol and generates an electric current.
- Amount of current generated is proportionate to the concentration of alcohol present.
- The higher the BAC, the greater will be the current output of the cell.

Test results are shown on a meter display.

- Meter shows BAC between 0.00% and 0.25%.
- The meter has 50 equally spaced divisions, making it possible to read BAC to three decimal places (e.g., 0.105%).
- The meter can be illuminated to facilitate reading results at night or in darkness.

Major Components

- Internal components include:
  - Fuel cell (alcohol detector).
  - Breath sample collection reservoir.
  - Breath sample flow sensor.
  - Heater unit.
  - Breath sample pump.
  - Battery pack (six "C" cells).
- External components include:
  - Breath intake port.
  - ANALYZE lamp.
  - PRESS-TO-ANALYZE pushbutton.
  - Temperature lamp.
  - Main power switch.
  - Meter display.
  - RESET pushbutton.
  - Meter light pushbutton.
  - External power connection port.
  - Battery test pushbuttons.
  - Calibration adjustment screw.
  - Zero adjustment screw.
  - Breath overflow port.
  - Cover switch.

Unit 5.4 – Notes

Display major components via visual or chalkboard.

Indicate that primary emphasis in this unit will be on external components.

Point out location of each external component.

Lights when temperature is too low.

Illuminates display. *Heater unit requires power from an external 12-volt source. Each pushbutton tests two of the six batteries.*

Vents excess breath sample to outside. *Turns off power when cover is closed. Analogous to light switch controlled by a refrigerator door.*

Component Functions and Characteristics

- The battery pack consists of three pairs of batteries.
  - The pair labeled "A" supplies positive potential to the detector unit.
  - The pair labeled "B" supplies negative potential to the detector unit.
  - The pair labeled "C" supplies power for the breath sample pump.
- External 12-volt power source is required for the heater unit.
  - Source connects via power cord to the external power connection port.
  - Patrol vehicle's electrical system supplies the necessary power.
  - Heater unit brings the temperature of the alcohol detector and breath sample reservoir up to 120°F.
  - In order to conduct a test, temperature must be at least 108°F.
  - Temperature will remain above 108°F for approximately 20 minutes when the Alco-Limiter is disconnected from its external power source.
- Main power switch turns on the instrument electronics and supplies power to display and indicator lamps.
  - Switch should be left in Off position until preparing for a test.
  - Cover switch provides redundant means of shutting off main power.
- ANALYZE lamp illuminates when a sufficient breath sample has been introduced.
  - ANALYZE lamp is activated by the breath sample flow sensor.
  - Sensor must detect a continuous breath flow for 5 seconds before ANALYZE lamp will light.
  - The last 20 cc of breath are trapped in the breath sample collection reservoir.
  - Excess breath is vented off through breath overflow port.
- PRESS-TO-ANALYZE pushbutton activates the breath sample pump.
  - Pump draws the trapped breath from the reservoir into the detector unit.
  - Pushbutton must be held down until the ANALYZE lamp extinguishes.
- Meter displays the test result.
  - Needle (pointer) automatically holds at its final value.
  - BAC is read directly from needle position.
  - RESET pushbutton returns the meter reading to zero.

Temperature lamp lights if temperature falls below 108°F.

Therefore instrument can be disconnected and taken outside the vehicle for a test.

Power automatically cut off when cover is closed.

Design ensures collection of a fixed volume of deep-lung breath.

Lamp extinguishes to indicate that the full 20 cc of breath have been drawn into the detector unit.

Turning off main power switch or depressing cover switch will also reset the meter.

Unit 5.4 – Contents

Test Requirements and Operating Procedures

Mouthpiece required for each test.

- Mouthpiece consists of a straight plastic tube containing a short length of pipe cleaner.
  - Pipe cleaner functions as a moisture trap.
- Mouthpiece fits securely into breath intake port.

Basic operating procedures:

- Keep the instrument connected to 12-volt source until ready to conduct test.
- Switch main power On.
- Verify that temperature light is out.
  - If temperature light is on, reconnect instrument to external power source and wait until operating temperature has been reached.
- Verify that needle is pointing to the "0" position of the meter.
  - If needle is above "0", depress and hold PRESS-TO-ANALYZE pushbutton for several seconds.
  - If needle remains above or below "0", zero adjustment is needed.
- When needle is at "0" position, insert a fresh mouthpiece into the breath intake port.
- Hold the instrument steady and level or place the instrument on a relatively flat surface, such as the hood of the patrol vehicle.
- Instruct the suspect that he will be required to blow moderately hard and steadily into the instrument.
- Instruct the suspect to start blowing and to continue to do so until you tell him to stop.
  - Listen for sound of excess breath venting through overflow port.
  - Ensure that suspect blows steadily until the ANALYZE lamp illuminates.
  - When ANALYZE lamp comes on, tell suspect to stop blowing.
- ***Remove the mouthpiece from the breath intake port*** **and discard mouthpiece.**
  - If mouthpiece remains in intake port when pump is activated, outside air will be drawn through mouthpiece into detector unit.
  - Residual alcohol remaining in mouthpiece will be drawn into detector.
  - Test result may be higher than actual BAC.

Display mouthpiece.

Demonstrate installation of mouthpiece. Remove mouthpiece after demonstration.

Display operating procedures via visual or chalkboard.

Pump action will help to clear any residual alcohol from previous test.

Zero adjustment procedures covered subsequently in this unit.

Emphasize that the instrument must not *be handed over to suspect.*

Remind trainees that the last 20 cc of breath now are trapped in the reservoir.

***Emphasize this step** and ask trainees why it is essential.*

Ensure that trainees fully understand the need to remove mouthpiece prior to analyzing breath sample.

- Depress and hold down PRESS-TO-ANALYZE pushbutton.
  - Pushbutton must be held down until the ANALYZE lamp extinguishes.
- Read test result (% BAC) from needle position.
  - Depress and hold meter light pushbutton if illumination is required to read meter.
- Switch main power off.
- Reconnect instrument to external power source.

Demonstrations of operating procedures:

- Inspector demonstration/dry run:
  - Instructor conducts test on himself.
- Inspector demonstration/mouth alcohol spray:
  - Instructor uses breath spray to create residual mouth alcohol condition.
  - Instructor conducts test on himself.
- Instructor demonstration/trainee subject:
  - Instructor recruits trainee to serve as test subject.
  - Instructor conducts test on trainee.
- Trainee Demonstration:
  - Instructor recruits two trainees, one to serve as test conductor, one as test subject.

Inspection, Adjustment, and Calibration Procedures

Principal inspection task is to check battery status.

- Battery check involves the battery test pushbuttons and the meter display.
  - Each pushbutton tests one pair of batteries.
  - When pushbutton is depressed and held down, needle will move on meter to indicate status of that battery pair.
  - Needle will move up to or beyond the line marked "BATT" if the battery pair is satisfactory.
  - If needle fails to move up to "BATT" line, both batteries of the tested pair must be replaced.
- Battery replacement procedures:
  - Loosen both retaining screws on the batteries' cover plate.
  - *Carefully* pull upwards evenly on the two retaining screws to free cover plate from instrument's surface.
  - When cover plate is fully exposed, hold the plate in both hands and *carefully* pull upwards to remove the complete battery assembly.

Unit 5.4 – Notes

RESET pushbutton may be used if another test is to be conducted immediately.

Verbalize operating steps during instructor demonstration.

Delay test for approximately 30 seconds following use of mouth spray.

Mouth spray may be used by trainee test subject.

Have test conductor verbalize operating steps.

Demonstrate battery test.

"BATT" line is at the 0.21% BAC position of the meter.

Display battery replacement procedures via visual or chalkboard. Demonstrate replacement procedures.

Do not attempt to pry cover loose with screwdriver, etc. This could damage the instrument's circuitry.

- Lay the battery assembly on a flat surface with the batteries upward (exposed).
- Inspect battery assembly for signs of corrosion.
- Remove discharged pair of batteries.
- Mark new batteries with replacement date.
- Install new batteries, making sure that polarity is correct.
- Hold cover plate with one hand and *carefully* align the edges of the circuit board with the guide slots in the instrument's face plate.
- *Gently* push the assembly back into the instrument until the cover plate is flush with the face plate.
- Tighten retaining screws.
- Re-test batteries.
- Mark or discard old batteries.

Zero check and adjustment is the process of ensuring that the display meter needle points to 0.00% BAC in an alcohol-free condition.

- To conduct a zero check/adjustment, the instrument must be connected to an external 12-volt source, and the temperature lamp must have been extinguished for at least 20 minutes.
- After proper preparation, check Zero:
  - Turn main power switch On.
  - Wait 5 seconds.
  - Depress RESET pushbutton and hold down for 5 seconds.
  - If needle points to "0" position on meter, instrument does not require zero adjustment.
  - If needle is above or below "0" position, adjustment is needed.
- Zero adjustment procedures:
  - Main power switch On.
  - Remove plug from Zero adjustment screw.
  - Insert compatible screwdriver into screw slot.
  - Depress and hold RESET pushbutton and turn screw until needle points to "0" position on meter.
  - Replace plug in adjustment screw opening.
  - Re-check to verify that Zero is properly adjusted.

Unit 5.4 – Notes

Inspect battery assembly for signs of corrosion.

Display visual showing proper polarity alignment.

If instrument was disconnected from 12-volt source for 12 or more hours, do not attempt to adjust zero for 1 hour.

Display and demonstrate Zero check procedures.

Turn screw clockwise to move needle to the right, counterclockwise to move needle to left.

NOTE: *Calibration should always be checked after Zero is adjusted.*

Calibration is the process of ensuring that the meter displays the correct BAC on an alcohol test.

- Equipment needed for calibration:
  - Breath alcohol simulator (either alcohol/water type or inert gas/alcohol vapor type) set to desired BAC equivalent.
  - Screwdriver compatible with the calibration adjustment screw.
  - Standard Alco-Limiter mouthpiece.
  - Plastic tubing to connect simulator to the mouthpiece.
- Calibration procedures—preparatory steps:
  - Ensure instrument is connected to an external 12-volt source and that temperature lamp has been extinguished for at least 20 minutes.
  - Turn main power switch On.
  - **Verify that needle is showing a valid Zero.**
  - **Install mouthpiece in the instrument.**
  - Connect simulator to mouthpiece.
  - Introduce simulator sample until ANALYZE lamp comes on.
  - **Remove mouthpiece from breath intake port and disconnect simulator.**
  - Depress and hold PRESS-TO-ANALYZE pushbutton until ANALYZE lamp goes out.
  - Read BAC from meter display.
  - If BAC reading is above or below the simulator's BAC equivalent, wait 1 minute and then depress RESET pushbutton.
  - Re-introduce and analyze a simulator sample.
  - If BAC reading still does not conform to simulator's BAC equivalent, calibration adjustment is needed.
- Calibration adjustment procedures:
  - Remove plug from calibration adjustment screw.
  - Insert screwdriver and turn screw until needle points to the simulator's BAC equivalent.
  - Depress RESET pushbutton.
  - **Wait 1 minute, then re-introduce and analyze simulator sample to check calibration setting.**
  - Replace plug in screw opening.
- Calibration check should be performed once every ____(days, weeks, etc.).

Unit 5.4 – Notes

Display equipment needed.

Display and demonstrate calibration procedures.

If instrument was disconnected from 12-volt source for 12 or more hours, wait 1 hour before calibrating.

Refer to Zero check procedures.

Verify airtight connection.

Emphasize this step.

Repeat adjustment if needed.

Demonstrate calibration procedures.

As per departmental policy and standard procedures.

Unit 5.5 – Contents

Introduction

Unit Title and Objectives

- Unit title—"PBT Operation—Alco-Sensor II"
- Unit objectives
  - Identify PBT used by department.
  - Identify and describe instrument components and their functions.
  - Describe procedures for operating, inspecting and calibrating the instrument.
  - Practice instrument operation.

Unit Content

- Introduction to the Alco-Sensor II preliminary breath testing device.
- Familiarization with the operating principles of the Alco-Sensor II, its major components and design features.
- Presentation and demonstration of procedures for operating, inspecting, and calibrating Alco-Sensor II.
- Practice conducting preliminary breath tests using the Alco-Sensor II.
  - Each trainee will have an opportunity to conduct at least ____ tests on the Alco-Sensor II.
  - Trainees will practice in ____ member teams.

Alco-Sensor II: General Description

Alco-Sensor II is a reusable preliminary breath testing device.

- Instrument weighs approximately 5 ounces and can easily be held in one hand.
- Operating procedures are relatively simple and straightforward.

Unit 5.5 – Notes

Unit title on chalkboard.

Refer trainees to unit objective in Trainee Instructional Manual.

Relate unit content to objectives.

As per procedures for the practice segment of this unit.

Display picture or accurate sketch of Alco-Sensor II.
Demonstrate ease of holding.

Unit 5.5 – Contents

Instrument Features and Operating Principles

Analytic Principle. **Alco-Sensor II uses a fuel cell (electrochemical cell) detector.**

- Cell membrane absorbs alcohol and converts it to an electric current.
- Amount of current generated is proportionate to the concentration of alcohol present.
- The higher the BAC, the greater will be the current output of the fuel cell.

Test Results are shown on a *digital display.*

- Display depicts a two-digit BAC value, with decimal point.

Major Components

- Internal components include:
  - Fuel cell (alcohol detector).
  - Breath sampling valve.
  - Battery (9 volts).
- External components include:
  - Temperature display.
  - SET pushbutton.
  - READ pushbutton.
  - Digital display.
  - Breath intake port.
  - Calibration adjustment screw.
  - Zero adjustment screw.

Component Functions and Characteristics

- Temperature display indicates temperature of fuel cell.
  - Most efficient operating range is 26–36° C.
  - Instrument will operate at lower temperature but accuracy is reduced and response is sluggish.
  - Instrument contains no heater; temperature depends on ambient conditions or external heat source.

Unit 5.5 – Notes

Write on chalkboard:
"Example: .10"

Display major components via visual or chalkboard.

Indicate that primary emphasis in this unit will be devoted to external components.

Point out location of each external component.

Point out that instrument can be kept at proper operating temperature by carrying it in an inside breast pocket, by keeping it inside a heated patrol vehicle, or by various other means.

- SET pushbutton electrically "shorts" the fuel cell.
  - Accelerates elimination of any residual alcohol from previous test.
- SET pushbutton also cocks the breath sampling valve.
  - Valve must be cocked in preparation for a test.
- READ pushbutton operates in two stages.
  - Releases the breath sampling valve, thus drawing 1 cc of breath/air into the fuel cell.
  - Turns the instrument "on" electrically, thus enabling analysis of the breath sample and display of test results.
- READ pushbutton also enables check of battery condition.
  - If "888" appears on digital display when READ pushbutton is depressed, the 9-volt battery needs replacement.
- Test result appears on digital display after completion of a test.

Test Requirements and Operating Procedures

Mouthpiece required for each test.

- Affix mouthpiece to breath intake port.
  - Make sure mouthpiece snaps securely into place.
  - Align mouthpiece for convenience of suspect and operator.

Basic Operating Procedures

- Depress SET pushbutton and place Alco-Sensor II in pocket for 5–10 minutes.
  - Make sure SET pushbutton holds in down position.
  - This step should be taken when first approaching the suspect.
  - 5- to 10-minute preparation period is desirable, but may not be necessary in every case.
- Observe temperature display and verify that temperature is between 26–36°C.
  - If temperature is too low, return instrument to pocket or other heat source for additional warm-up.
  - If temperature is too high, expose instrument to outside air and wait until it is properly cooled.
- Press and hold down READ pushbutton for 10 seconds.
  - Verify that SET pushbutton is released when READ is depressed.

Unit 5.5 – Notes

Operator must press READ pushbutton while suspect is blowing into mouthpiece in order to obtain sample of suspect's breath.

Write on chalkboard: "Replace battery if 888 appears on digital display."

Display mouthpiece and demonstrate its installation. Remove mouthpiece after demonstration.

Display operating procedures via visual or chalkboard.

This step enables elimination of any residual alcohol from previous test and helps to bring instrument to proper operating temperature.

Step will not be needed if instrument is at proper temperature and any residual alcohol has been eliminated.

Test must not be taken if SET does not release or if battery is too weak ("888" on display).

- Verify that "888" does not appear on digital display.
- Verify that a reading of .00 stays on the display continuously for the full 10 seconds.

- If the display shows anything higher than .00 during the 10 seconds that the READ pushbutton is depressed:
  - Re-depress SET pushbutton and return instrument to pocket.
  - After several minutes, re-check Zero by depressing and holding READ for 10 seconds.
  - If .00 does not appear continuously for 10 seconds with READ depressed, manually readjust ZERO setting.
- Once valid Zero check has been made, depress SET pushbutton and mount mouthpiece on breath intake port.
- Instruct suspect that he will be required to blow hard and steadily for as long as possible.
- Hold instrument toward suspect and instruct him to start blowing and to continue to do so until you tell him to stop.
  - Listen to sound of breath passing through mouthpiece to verify that suspect is providing valid breath sample.
  - Hold thumb above READ pushbutton in preparation for obtaining a breath sample.
  - Closely observe suspect for indications that he is nearing the end of his exhalation.
- Near the end of the suspect's exhalation, momentarily depress READ pushbutton.
  - Instruct suspect to stop blowing.
  - Remove and discard mouthpiece.
  - Wait 10 seconds to allow for absorption of alcohol by the fuel cell membrane.
- Depress and hold READ pushbutton continuously.
  - Closely observe digital display.
  - When display stabilizes to a steady value, read and record the test result.
- Depress SET pushbutton to accelerate elimination of residual alcohol.

Demonstration of Operating Procedures

- Instructor demonstration/dry run:
  - Instructor conducts test on himself.
- Instructor demonstration/mouth alcohol spray:
  - Instructor uses breath spray to create residual mouth alcohol condition.
  - Instructor conducts test on himself.

Unit 5.5 – Notes

Primary purpose of this step is to check for a valid Zero reading.

Re-depress SET provides additional time for elimination of residual alcohol from previous test.

Procedures for adjusting Zero setting are presented later in this unit.

Breath sampling valve is cocked, and instrument is ready for test.

Emphasize that instrument must not be handed over to suspect.

Point out that most suspects will be able to supply at least 8–10 seconds of breath.

This step collects 1 cc of suspect's breath.

Point out that the value in the digital display window will change (increase) during the first 30–60 seconds. Finally, display will stabilize.

Verbalize operating steps during instructor demonstrations.

Delay test for approximately 30 seconds following use of mouth spray.

- Instructor demonstration/trainee subject:
  - Instructor recruits trainee to serve as test subject.
  - Instructor conducts test on trainee.
- Trainee demonstration:
  - Instructor recruits two trainees, one to serve as test conductor, one as test subject.

Inspection, Adjustment and Calibration Procedures

Principal inspection tasks are to check operation of SET and READ pushbuttons, check temperature displays, and check battery status.

- Depress SET and READ pushbuttons.
  - SET should hold in down position when depressed.
- Place instrument in a controlled temperature environment for approximately 20 minutes.
  - Controlled temperature should be between 26 and 36°C (approximately 79–97°F).
  - At the end of the period, instrument's temperature display should show 26–36°C.
- Check battery by depressing and holding READ pushbutton.
  - If "888" appears in digital display window, battery needs replacement.
- Battery replacement procedures:
  - Mark new battery with replacement date.
  - Slide battery door open.
  - Remove old battery.
  - Observe polarity markings on battery door.
  - Insert new battery.
  - Close battery door.
  - Mark or discard old battery.
  - Depress READ pushbutton and observe the digital display to verify that new battery is installed and operating properly.

Zero adjustment is the process of ensuring that a blank (alcohol-free) sample will produce a steady reading of .00.

- Instrument must be prepared for a Zero check/adjustment by maintaining it at operating temperature with SET pushbutton depressed for at least 10 minutes.

Unit 5.5 – Notes

Mouth spray may be used by trainee test subjects.

Have test conductor verbalize operating steps.

Use an accurate centigrade thermometer to compare the temperature.

Display battery replacement procedures via chalkboard or visual.

Demonstrate replacement procedures.

i.e., "888" does not appear.

Ensures elimination of any residual alcohol from previous test.

- After proper preparation, check Zero by depressing and hold READ pushbutton for 10 seconds.
  - Digital display should show .00, preceded by a flashing symbol: "–" ("minus" sign).
  - If a higher value appears, or if the symbol "–" is not flashing, a Zero adjustment is needed.
- Zero adjustment procedures:
  - Depress and hold down READ pushbutton continuously during adjustment.
  - Wait 10 seconds.
  - Using compatible screwdriver, turn Zero adjustment screw *clockwise* until display shows –.00 (with "–" *not* flashing).
  - Turn Zero adjustment screw *counterclockwise* until .00 appears with "–" flashing.
  - Depress SET pushbutton and wait 20 seconds.
  - Re-check Zero by depressing and holding READ pushbutton for 10 seconds.

Calibration is the process of ensuring that the instrument produces an accurate BAC measurement.

- Equipment needed for calibration.
  - NALCO Standard breath alcohol simulator (or equivalent) set for desired BAC level.
  - Screwdriver compatible with the calibration adjustment screw.
  - Standard Alco-Sensor II mouthpiece.
  - Short plastic tubing for connecting NALCO Standard to mouthpiece.
- Calibration procedures—preparatory steps:
  - Make sure the Alco-Sensor II has not been used for 2 hours.
  - Maintain instrument at proper temperature setting with SET pushbutton depressed for at least 15 minutes.
  - Depress READ pushbutton and verify that Zero is set properly.
  - Affix mouthpiece to instrument.
  - Re-depress SET pushbutton.
  - Connect NALCO Standard to the *short end* of the mouthpiece, via plastic tubing.
  - Deliver simulator sample by depressing pressure valve on NALCO Standard; allow flow to continue for several seconds.
  - While flow is continuing, momentarily depress READ pushbutton.
  - Cease simulator flow; remove mouthpiece from Alco-Sensor II.

Unit 5.5 – Notes

Depressing READ introduces 1 cc of outside air into fuel cell.

Write on chalkboard:

– .00
↖
(flashing)

Display and demonstrate Zero adjustment procedures.

Repeat adjustment procedures if – .00 with flashing "–" does not stay on for full 10 seconds.

Display equipment needed.

Display calibration procedures via visual or chalkboard.

First step not necessary if instrument was used for fewer than five tests in the past hour.

Hold READ for 10 seconds; check for – .00 display with flashing "–".

Ensure airtight connection.

Introduces 1 cc of simulator gas into fuel cell.

- Depress READ pushbutton and hold down until digital display reading stabilizes.
- Compare test result with known BAC value of the simulator; if results do not agree, calibration adjustment is needed.

- Calibration procedures—adjustment steps:
  - Using compatible screwdriver, turn calibration adjustment screw *clockwise* three full turns.
  - Repeat preparatory steps described above. Test result obtained should now be *higher* than simulator's BAC value. *Keep READ pushbutton depressed.*
  - When test result reads higher than simulator's BAC value, turn calibration adjustment screw *counterclockwise* until correct value is just displayed, i.e., next higher number just turns off. *Keep READ pushbutton depressed.*
  - Continue to observe digital display. If result increases in value, again turn calibration adjustment screw counterclockwise to bring correct value back.

- Calibration check should be performed once every ____ (days, weeks, etc.)

Unit 5.5 – Notes

If test result is lower than simulator's value, again turn calibration adjustment screw three turns clockwise, and again repeat preparatory steps.

Do not turn calibration adjustment screw clockwise during this or succeeding steps.

Continue as needed until result stabilizes at correct value.

Demonstrate calibration procedures.

As per departmental policy and standard procedures.

Trainee Practice Segment

Preparation

- Divide trainees into two-member teams.
  - Team assignments provide for "buddy system" practice.
  - As each trainee conducts a practice test, his team partner will observe and critique his performance.
  - Team partners will take turns conducting tests, following an assigned schedule.
- Practice modalities.
  - Dry runs: Each trainee conducts tests on his partner.
  - Simulator tests with known BAC equivalent.
  - Simulator tests with unknown BAC equivalent.
  - Volunteer subject tests.
- Provide practice materials.
  - PBT instrument(s) for each team.
  - Mouthpieces.
  - Team schedule assignments.
  - Forms for recording practice test results.

Conduct of Practice

- Practice will proceed in accordance with the team schedule assignments.
  - Instructor must ensure that schedules are followed.
  - Continuous monitoring of trainees is required throughout the practice.
- Trainees will record each test result on their practice test recording forms.
  - Instructor must check test records during practice.

Unit 5.6 — Notes

In the event that there is an odd number of trainees, one team will have three members; alternatively, an instructor's aide can be assigned as one trainee's partner.

Instructor must select which of these practice modalities are to be used; ideally, all should be used.

Trainees should be instructed to operate simulators for their partners.

Sample team schedule assignments are shown on the following pages.

Make sure that each team understands its assignment and schedule.

Encourage trainees to ask for assistance as needed.

Instructor or instructor aide must observe and critique at least one test by every trainee.

Sample Team Schedule Assignments

Note: The following assumptions are made for this set of sample assignments.
Sixteen trainees divided into eight teams.
Two volunteer drinking subjects.

Four breath-alcohol similators (A, B, C, D).
A and C have known BAC equivalent; B and D have unknown BAC equivalent.

Elapsed Time (minutes)	Team 1 Members: Able, Baker	Team 2 Members: Adams, Brown	Team 3 Members: Ames, Blaine	Team 4 Members: Archer, Black
	Able tests Baker	Adams tests Brown	Ames tests Blaine	Archer tests Black
5	Baker tests Able	Brown tests Adams	Blaine tests Ames	Black tests Archer
	Able tests Simulator A	Observe Able, Baker on Simulator A	Ames tests Simulator B	Observe Ames, Blaine on Simulator B
10	Baker tests Simulator A	Adams tests Simulator B	Blaine tests Simulator B	Archer tests Simulator A
	Observe Adams, Brown on Simulator B	Brown tests Simulator B	Observe Archer, Black on Simulator A	Black tests Simulator B
15	Able tests Simulator B	Observe Able, Baker on Simulator B	Ames tests Simulator A	Observe Ames, Blaine on Simulator A
20	Baker tests Simulator B	Adams tests Simulator A	Blaine tests Simulator A	Archer tests Simulator B
	Observe Adams, Brown on Simulator A	Brown tests Simulator A	Observe Archer, Black on Simulator B	Black tests Simulator B
25	Able tests Simulator D	Adams tests Subject 1	Ames tests Blaine	Archer tests Simulator C
30	Baker tests Simulator D	Brown tests Subject 1	Blaine tests Ames	Black tests Simulator C
	Able tests Subject 1	Adams tests Simulator D	Ames tests Simulator C	Archer tests Black
35	Baker tests Subject 1	Brown tests Simulator D	Blaine tests Simulator C	Black tests Archer
	Able tests Baker	Adams tests Simulator C	Ames tests Subject 1	Archer tests Simulator D
40	Baker tests Able	Brown tests Simulator C	Blaine tests Subject 1	Black tests Simulator D
	Able tests Simulator C	Adams tests Brown	Ames tests Simulator D	Archer tests Subject 1
45	Baker tests Simulator C	Brown tests Adams	Blaine tests Simulator D	Black tests Subject 1

Sample Team Schedule Assignments (continued)

Elapsed Time (minutes)	Team 5 Members: Charles, Dawes	Team 6 Members: Creed, Davis	Team 7 Members: Clark, Dennis	Team 8 Members: Church, Dolan
	Charles tests Dawes	Creed tests Davis	Clark tests Dennis	Church tests Dolan
5	Dawes tests Charles	Davis tests Creed	Dennis tests Clark	Dolan tests Church
	Charles tests Simulator C	Observe Charles, Dawes on Simulator C	Clark tests Simulator D	Observe Clark, Dennis on Simulator D
10	Dawes tests Simulator C		Dennis tests Simulator D	
	Observe Creed, Davis on Simulator D	Creed tests Simulator D	Observe Church, Dolan on Simulator C	Church tests Simulator C
15		Davis tests Simulator D		Dolan tests Simulator C
	Charles tests Simulator D	Observe Charles, Dawes on Simulator D	Clark tests Simulator C	Observe Clark, Dennis on Simulator C
20	Dawes tests Simulator D		Dennis tests Simulator C	
	Observe Creed, Davis on Simulator C	Creed tests Simulator C	Observe Church, Dolan on Simulator D	Church tests Simulator D
25		Davis tests Simulator C		Dolan tests Simulator D
	Charles tests Simulator B	Creed tests Subject 2	Clark tests Dennis	Church tests Simulator A
30	Dawes tests Simulator B	Davis tests Subject 2	Dennis tests Clark	Dolan tests Simulator A
	Charles tests Subject 2	Creed tests Simulator B	Clark tests Simulator A	Church tests Dolan
35	Dawes tests Subject 2	Davis tests Simulator B	Dennis tests Simulator A	Dolan tests Church
	Charles tests Dawes	Creed tests Simulator A	Clark tests Subject 2	Church tests Simulator B
40	Dawes tests Charles	Davis tests Simulator A	Dennis tests Subject 2	Dolan tests Simulator B
	Charles tests Simulator A	Creed tests Davis	Clark tests Simulator B	Church tests Subject 2
45	Dawes tests Simulator A	Davis tests Creed	Dennis tests Simulator B	Dolan tests Subject 2

Unit 6
Course Summary

Time:
30 minutes
(approximate)

Objectives

Provide a recapitulation of course contents to help ensure that the trainee retains the knowledge, skill and attitudes desired.

Provide an opportunity to evaluate the trainees' knowledge, skill, and attitudes.

Provide an opportunity to acquire input from trainees for use in course evaluation.

Instructor's Tasks

The instructor's principal tasks in this unit are to determine whether the program's training objectives have been met, to correct any deficiencies in the trainees' knowledge, skills and attitudes, and to assess the effectiveness of the course and his own performance as a teacher.

Evaluation is the principal mission of this unit. The "Course Recapitulation" segment is designed to provide an informal evaluation of what the trainees have learned. The mechanism used for this evaluation is a review of the course; however, it is intended that the *trainees* will conduct the review. The instructor's role is to pose questions. He should select trainees at random to answer the questions; each trainee should have at least one opportunity to respond. By the time that the recapitulation is completed, the instructor should have a reasonably accurate assessment of how well the training objectives were met.

The segment entitled "Course Evaluation" is intended to address the other component of evaluation, viz., how well the course was designed and administered and how well the instructor performed as a teacher. This too can be accomplished informally, i.e., by soliciting trainees' comments and suggestions.

Formal evaluation of trainees, via oral or written tests or skill demonstrations, is optional. It is recognized that in many cases time and budgetary constraints will preclude such formal evaluation. However, formal evaluation can provide very valuable inputs to course revision and improvement. A list of possible test questions is presented below. The instructor could incorporate these and similar items into formal oral or written tests. He should in any event review the list as a source of possible questions for the informal evaluation during Course Recapitulation.

Questions for Trainee Evaluation

1. What is the definition of prearrest screening?
2. What is the justification for the claim that a BAC of 0.10% or more indicates that a person is under the influence of alcohol?
3. What elements must be established to convict a person of operating under the influence?
4. What does the so-called Implied Consent Law state?
5. What does the so-called Prearrest Screening Law state?
6. What is the penalty for refusing a prearrest screening test?
7. Under what conditions can a drinking-driving suspect refuse the prearrest screening test without penalty?
8. According to departmental policy and procedures, when should you *not* request a drinking-driving suspect to take a preliminary breath test?
9. Name *five* cues (other than BAC) that might indicate that a person is under the influence of alcohol.

10. In general, a chemical test for BAC can be made of any body fluid or tissue, provided that fluid or tissue contains (blood, water, sugar). (Choose which:_____.)
11. If a body fluid contains a higher proportion of water than does the blood, the percentage of alcohol in the fluid will be (higher, lower) than the percentage of alcohol in blood. (Choose which:_____.)
12. A given volume of blood contains _____ times as much alcohol as does the same volume of deep-lung breath.
13. What is the technical term for deep-lung breath?
14. Name three factors that can affect the accuracy of a breath test for BAC and describe the effects of each factor.
15. Name two breath analysis techniques that are commonly used for prearrest screening.
16. Name the PBT instrument(s) used by this department and describe the analytic principle of the instrument(s).
17. Describe the basic operating procedures of the instrument(s).

A written test for this course that was used during its development is contained in Appendix B. The instructor may wish to use this test as is or model his own version on this one.

Unit 6 – Notes

Unit 6 – Contents

Introduction

Unit Title and Objectives

- Unit Title—"Course Summary"
  - Recapitulate course contents to ensure trainees' retention of knowledge, skills, attitudes desired.
  - Evaluate trainees' knowledge, skills, attitudes.
  - Provide opportunity for trainees to evaluate the course and their own learning experience.

Unit Content

- Review of the material covered in the previous units.
  - Review is to be highly interactive on the part of trainees.
  - Informal question-and-answer approach will be used throughout the review.
- Evaluation will attempt to determine:
  - How well trainees achieved the performance objectives.
  - How well the course was conducted.

Course Recapitulation

Overall Course Objective

- Relationship of prearrest screening to the overall objective of improving effectiveness of drinking-driving enforcement.
- Role of prearrest screening limited to assisting in the identification of drinking-driving violators.
- Prearrest screening assists but does not replace officer's judgment.

Types of Drinking-Driving Offenses

- Definition of each offense.
- Elements of each offense.
- Relevance of BAC measurements.

Pre-arrest Screening Legal Environment

- Statutory basis and limitations.
- Departmental policies and procedures.

Unit 6 – Notes

Unit title on chalkboard.

i.e., trainees will conduct the review by responding to instructor's questions.

Emphasize that trainees' comments and suggestions for course improvement are very welcome.

Ask trainees to state the overall course objective and to describe the relationship of prearrest screening to this objective. Ask follow-up questions, as needed, until all key points are mentioned.

Ask trainees to define each drinking-driving offense and its elements and the role of BAC as evidence of each offense.

Ask trainees to describe the prearrest screening statute and departmental policies and procedures governing prearrest screening. Ensure that answers highlight all limitations and constraints governing use of PBT's.

Unit 6 – Contents

Chemical Tests of BAC
- General types of chemical tests.
- Basis for indirect chemical tests (equilibrium).
- Factors affecting breath test accuracy.
- Breath analysis techniques.
- Types of breath testing devices used for prearrest screening.

PBT Effectiveness
- Two major benefits of PBT's:
  - Increased arrests.
  - Decreased average BAC of arrest.
- PBT accuracy, reliability, acceptability.

PBT Operation
- Operating procedures.
- Inspection and calibration procedures.

Trainee Evaluation (Optional)

Oral Test

Written Test

Unit 6 – Notes

Ask trainees to describe each of the listed items.

Ask trainees to describe benefits and cite findings that support these.

Ask trainees to describe these procedures for each PBT instrument.

If applicable and desired.

Unit 6 – Contents

Skill Demonstration

Course Evaluation

Trainee Comments and Suggestions

Evaluation Form(s)

Completion

Solicit final questions and comments from trainees.

Course Completion Certificates

Unit 6 – Notes

If applicable and desired.

If applicable.

Unit 6 – Contents

Closing Remarks

Appendix A

Guidelines for Controlled Drinking Sessions

One of the principal objectives of Unit 5 (PBT Operation) is to provide the trainee with hands-on practice on the PBT instrument to aid him in acquiring basic operating skills. One particularly helpful practice modality involves use of *volunteer drinking subjects*. These are individuals who will agree to consume measured amounts of alcohol and subsequently submit to repeated PBT tests administered by trainees. There are, of course, other practice modalities that can and should be used, e.g., breath alcohol simulators and "dry runs" administered to sober individuals. However, there are several training advantages that are provided by volunteer drinking subjects:

- First and foremost, the practice will simply be more *realistic;* trainees will have an opportunity to conduct tests of persons who are, in fact, under the influence of alcohol, thus simulating the suspects they will encounter in the field.
- Trainees will have an opportunity to compare their own unaided observations with the results of PBT tests; prior to testing a volunteer drinking subject, they should be asked to assess the subject's state of impairment. If done properly, this will help to motivate the trainees to accept and use PBT's.
- Trainees will acquire first-hand experience in administering tests to persons affected by alcohol; they will learn how to instruct suspects to take the test and what types of problems might arise if the suspect's comprehension or physiological reactions are impaired.

In order to realize these advantages, careful and complete *control* must be exercised over the volunteer drinking subjects. A lack of proper control will quickly result in an unbridled situation that will detract from learning.

Specific Procedures

1. Types of Individuals Recruited as Volunteer Drinking Subjects

Most importantly, the volunteers must have *no* history of alcohol problems or any medical conditions that would be exacerbated by drinking. Similarly, the volunteers should not be teetotalers or extremely light/infrequent drinkers, since their reaction to alcohol may be adverse. Volunteers should be moderate social drinkers in good physical health. They must also be of legal drinking age, and they should have no connection with the course apart from their role as subjects.

Volunteers must be completely informed of what their participation will entail and must give their consent in writing. A sample Informed Consent Form is shown at the end of this Appendix.

2. Levels of BAC to be Achieved

It is recommended that the volunteers be administered only enough alcohol to achieve a maximum BAC between 0.08–0.12%. This will place them in the range where the PBT is most useful for drinking-driving investigation. It also will reduce the likelihood of the deleterious side effects, such as nausea, vomiting, or severe psychophysical impairment, that typically accompany higher BAC's.

3. Types of Drinks to be Administered

In theory, any type of alcoholic beverage could be used to achieve the target levels of BAC. In practice, it is wise to avoid carbonated drinks or large volumes of liquid, since these would be more likely to induce nausea.

The recommended drink would consist of a mixture of water, fruit juice, and grain alcohol (vodka), in the following proportions:

- Three parts vodka (100 proof)
- One part water
- Two parts fruit juice (orange, grapefruit, etc.)

This type of drink has been used widely and with good success in numerous research programs. Although it is unlikely to be the usual, or preferred, drink of any volunteer, virtually all should find it at least acceptable.

4. Number of Drinks Administered

Each volunteer should be issued three drinks. Each drink will contain one-third of the total amount of alcohol calculated as required to achieve the target BAC. Fifteen minutes should be allowed for the consumption of each drink. The first two drinks should be taken in succession; i.e., the first will be consumed from time = 0 minutes to time = 15 minutes; the second from time = 15 minutes to time = 30 minutes. A 15-minutes "break" should take place between the second and third drinks; the third drink will be consumed between time = 45 minutes and time = 60 minutes. Thus, a total of one hour will be used during drink consumption. Subjects must be kept to this schedule to ensure that their BAC's increase at approximately uniform rates.

If the above procedure is followed, the subjects should attain their maximum BAC at (approximately) time = 80 minutes, at which point they will be ready for trainee practice.

5. Calculation of Amounts of Alcohol Required

The amount of alcohol that each drink should contain depends upon the target BAC and the subject's weight. The next page tabulates the dosage (100 proof Vodka) requirements for maximum BAC's of 0.08% and 0.12%.

For convenience, the drinks should be prepared beforehand and kept refrigerated until needed.

Note: The prescribed drink volumes presume that the subjects have essentially empty stomachs. Since the controlled drinking

and trainee practice segment usually will follow the lunch hour, subjects must not be permitted to have lunch prior to the session.

6. Supervision of Subjects

Subjects must be kept under constant supervision from the time that drinking commences. An instructor's aide should be assigned to monitor the subjects, serve their drinks, regulate their drinking schedule, and, in general, keep them under close observation.

Subjects must be transported to and from the session. Under no circumstances should subjects be permitted to drive from the session. It is recommended that they be kept at the instructional facility until their BAC's fall below 0.05% (this should occur within approximately 4½ hours after their last drink).

7. Drinking Schedule

Ideally, the subjects should be at their peak BAC's at the start of the trainee practice session. To accomplish this, they should start their drinking simultaneously with the commencement of Unit 5.

You should also consider conducting evidentiary tests and PBT's concurrently to confirm BAC results.

Amounts of 100 Proof Vodka and Mixers Required to Achieve the Target BAC of 0.12% as a Function of Body Weight

Weight (Pounds)	Total Amount of Vodka in Ounces (Milliliters)	Each of 3 Drinks, in Ounces (Milliliters)		
		Vodka	Juice	Water
100-120	3.75 (112.5)	1.25 (37.5)	0.83 (25)	0.42 (12.5)
121-140	4.25 (127.5)	1.42 (42.5)	0.95 (28.3)	0.47 (14.2)
141-160	4.75 (142.5)	1.58 (47.5)	1.05 (31.7)	0.53 (15.8)
161-180	5.50 (165)	1.83 (55)	1.22 (36.7)	0.61 (18.3)
181-200	6.00 (180)	2.00 (60)	1.33 (40)	0.67 (20)
201-220	6.75 (202.5)	2.25 (67.5)	1.50 (45)	0.75 (22.5)

Note: For target BAC of 0.08%, use two-thirds of the amounts listed above.

Sample Informed Consent Statement

I hereby volunteer to serve as a drinking subject for the prearrest screening training program. I understand that I will be requested to consume alcoholic beverages, and may attain a peak blood alcohol concentration of approximately 0.12%. I have been informed that my ability to operate a motor vehicle would be impaired to an unsafe degree at that concentration. Accordingly, I agree to refrain from driving for at least 6 hours following my participation in this program.

I also understand that I will be requested to submit to a series of breath tests, that will monitor the concentration of alcohol in my blood.

I represent that I am in good physical health, and that I have never been diagnosed as an alcholic. I further attest that I am not taking any prescription or nonprescription medication or drugs that might interact with alcohol in a harmful way.

I have been informed that I will be requested to consume 3 drinks in a period of approximately one hour, and that these drinks will contain a total of_____ounces of Vodka (100 proof).

I understand that my participation is totally voluntary and that I am free to refuse any and all drinks, and to withdraw from the program at any time.

Volunteer's Name: _____

Signature: _____

Witnessed by: _____

Instructor: _____

Date: _____ / _____ / _____

Appendix B

Sample Written Test for Preliminary Breath Testing

SECTION ONE

In each box (☐) please write the letter (A, B, C, or D) that corresponds to the most appropriate word or phrase that will complete the sentence.

1. According to the American Medical Association, *all* drivers should be considered to be under the influence of alcohol if they have a BAC of ☐ or more:
   - A. 0.05
   - B. 0.08
   - C. 0.10
   - D. 0.15

2. At a BAC of 0.08, the average driver is about ☐ times more likely to have an accident that he is when he is totally sober:
   - A. Twice as likely
   - B. Four times as likely
   - C. Eight times as likely
   - D. Ten times as likely

3. After drinking, alcohol is deposited in the body's various organs and tissues in proportion to the ☐ content of the organs and tissues.
   - A. Water
   - B. Blood
   - C. Fat
   - D. Weight

4. To help make sure that the test result is accurate, a breath alcohol test should not be conducted if the suspect has taken a drink during the past ☐:
   - A. 5 minutes
   - B. 15 minutes
   - C. 25 minutes
   - D. half-hour

5. The so-called *implied consent law* only applies to suspects who have been ☐:
   - A. Driving
   - B. Drinking
   - C. Drinking *and* driving
   - D. Arrested

6. The expression "ALVEOLAR BREATH" refers to a breath sample that ☐:
   - A. Comes from the upper part of the lungs:
   - B. Comes from the deepest part of the lungs:
   - C. Has been tested to determine alcohol content:
   - D. Is contaminated by the alcohol from a drink recently taken.

7. We can use a *BREATH* test to measure the concentration of alcohol in the *blood* because of the chemical principle known as ☐:
   - A. Boyle's law
   - B. Diffusion
   - C. Oxidation
   - D. Equilibrium

8. A *blood* test is the only ☐ test for BAC:
   - A. Completely accurate
   - B. Admissible
   - C. Direct
   - D. Laboratory

9. If he drinks on an empty stomach, a 170-lb man will reach a BAC of 0.10 if he has ☐ drinks in 4 hours:
   - A. Four
   - B. Eight
   - C. Ten
   - D. Twelve

10. A given volume of blood contains about ☐ times as much alcohol as does the same volume of deep-lung breath:
    - A. 1,100
    - B. 2,100
    - C. 3,100
    - D. 4,100

SECTION TWO

Place a check-mark (✓) to the left of each phrase or statement that correctly answers the question. NOTE: A question may have more than one correct answer; check *all* answers that are correct.

11. Under what circumstances should you *not* request a person to submit to a preliminary breath test?
    - ____ When you feel certain he is *not* under the influence.
    - ____ When you feel certain he *is* under the influence.
    - ____ When you honestly are not certain whether he is or is not under the influence.
    - ____ When it seems likely that he will refuse the request.
    - ____ When he admits that he has been drinking.

12. What is likely to diminish the accuracy of a breath alcohol test?
    - ____ The fact that the test is performed by non-medical personnel.
    - ____ Residual alcohol fumes in the mouth.
    - ____ Certain kinds of substances, like ether or acetone, if they are present.
    - ____ A mixture of upper-lung and deep-lung breath.
    - ____ Presence of water vapor in the breath.

13. What methods or techniques are commonly used to perform breath alcohol tests?
    - ____ Ultraviolet Absorption
    - ____ Oxidation/Photometric
    - ____ Gas Interferometry
    - ____ Electrochemical Oxidation
    - ____ Gas Chromatography

SECTION THREE

Indicate whether each of the following statements is TRUE (T) or FALSE (F) by circling the appropriate letter:

14. BAC is the percentage of alcohol in a person's blood: T F

15. Preliminary breath tests are most appropriate for investigating "borderline" DWI violators: T F

16. The implied consent law authorizes the conduct of preliminary breath tests: T F

17. An officer should attempt to conduct a preliminary breath test whenever he cannot determine whether the suspect is or is not under the influence of alcohol: T F

18. Research shows, on the average, that preliminary breath testing approximately doubles the number of DWI arrests: T F

19. Two different people who have the same BAC will always have the same degree of alcohol impairment: T F

20. If a breath sample contains tidal breath, the breath test result will be lower than the person's actual BAC. T F

Appendix C

Recommended Training Aids

These *Recommended Training Aids* will help the instructor conduct the basic course in preliminary breath testing. This volume is a companion document to the Instructor's Lesson Plan Manual.

This course does not require elaborate or expensive audiovisual support. However, simple and inexpensive visuals, if properly used, can enhance the teaching-learning environment and contribute to training effectiveness. The contents of this document represent one *possible* set of visuals. Each piece of art is keyed to a particular lesson topic and is cross-referenced in the Instructor's Lesson Plan Manual. The paper copies here can easily be made into transparencies for overhead projection or into 35mm slides. Together with a chalkboard, these slides will satisfy all of the visual aid needs of the course. The instructor should feel free, however, to develop and use additional slides or other aids to enhance the presentation. In addition, some PBT manufacturers have prepared slides and brochures that depict their product and its operating characteristics. The instructor may wish to examine such materials.

Finally, although films or other elaborate audiovisuals are not required for the course, the instructor may know of some that would add to the course's effectiveness. Such aids should be incorporated into this course, provided they do not supplant or otherwise conflict with the basic content material.

Overall Course Objective:

To improve the effectiveness of drinking-driving enforcement through the proper and efficient use of preliminary breath test (PBT) instruments.

Visual 1-1. This art has been designed for use as is with an opaque projector, or as base art for conversion into a vu-graph or 35-mm slide.

Switch Options

to see the switch options that are available during the
thermostat's initialization process. Use the
Up/Down (Heat/Cool) buttons to select the
desired option, then press the Fan button to
advance to the next option.

Preliminary Breath Test Defined:

A prearrest breath test taken during investigation of a possible DWI violator to obtain indication of blood alcohol concentration.

Visual 1-2. This art has been designed for use as is with an opaque projector, or as base art for conversion into a vu-graph or 35-mm slide.

Damaged tear, tissue missing

Repaired tear, tissue replaced

Stain or discoloration

Tape or adhesive residue

Torn or folded corner

Water damage

Course Performance Objectives: (What You Will Be Able To Do)

- Describe purpose, benefits, and effectiveness of PBTs for DWI enforcement.
- Identify and describe laws, regulations, policies, and procedures affecting DWI enforcement and prearrest screening.
- Describe basic principles and types of chemical tests used in DWI enforcement.
- Identify PBT instruments and describe their operating characteristics, accuracy, and reliability.
- Demonstrate basic skills needed to operate PBTs.

Visual 1-3. This art has been designed for use as is with an opaque projector, or as base art for conversion into a vu-graph or 35-mm slide.

Course Content

Unit 1 Overview and Introduction

Unit 2 Legal and Operational Environment

Unit 3 Chemical Testing

Unit 4 PBT Equipment

Unit 5 PBT Operation

Unit 6 Summary

Visual 1-4. This art has been designed for use as is with an opaque projector, or as base art for conversion into a vu-graph or 35-mm slide.

Course Content

Unit 1 Overview and Introduction

Unit 2 Legal and Operational Environment

Unit 3 Chemical Testing

Unit 4 EBT Equipment

Unit 5 EBT Operation

Unit 6 Assessment

Possible Indicators of DWI: Detection Cues Prior to Stopping Suspect

- Turning With Wide Radius
- Straddling Center or Lane Marker
- Appearing To Be Drunk
- Almost Striking Object or Vehicle
- Weaving
- Driving on Other Than Designated Roadway
- Swerving
- Slow Speed (More than 10 mph below limit)
- Stopping Without Cause In Traffic Lane
- Following Too Closely
- Drifting
- Tires on Center or Lane Marker
- Braking Erratically
- Driving Into Opposing or Crossing Traffic
- Signaling Inconsistent With Driving Actions
- Slow Response to Traffic Signals
- Stopping Inappropriately (Other than in lane)
- Turning Abruptly or Illegally
- Accelerating or Decelerating Rapidly
- Headlights Off

Visual 2-1. This art has been designed for use as is with an opaque projector, or as base art for conversion into a vu-graph or 35-mm slide.

READEX FICHE

best copy available

Possible Indicators of DWI: Investigation Cues After Stopping Suspect

- **Speech** (slurred; sluggish)
- **Breath Odor of Alcoholic Beverage**
- **Facial Expression** (dazed; blank; lack of comprehension)
- **Eyes** (dilated pupils; watery; bloodshot)
- **Movements** (overly slow, deliberate; fumbling; unsteady; uncoordinated)
- **Clothing** (disarrayed)

Visual 2-2. This art has been designed for use as is with an opaque projector, or as base art for conversion into a vu-graph or 35-mm slide.

Dynamic Multiple Access Protocol (DMAP)

Assigned Slot Protocol

Contention Slot Protocol

Reservation Protocol

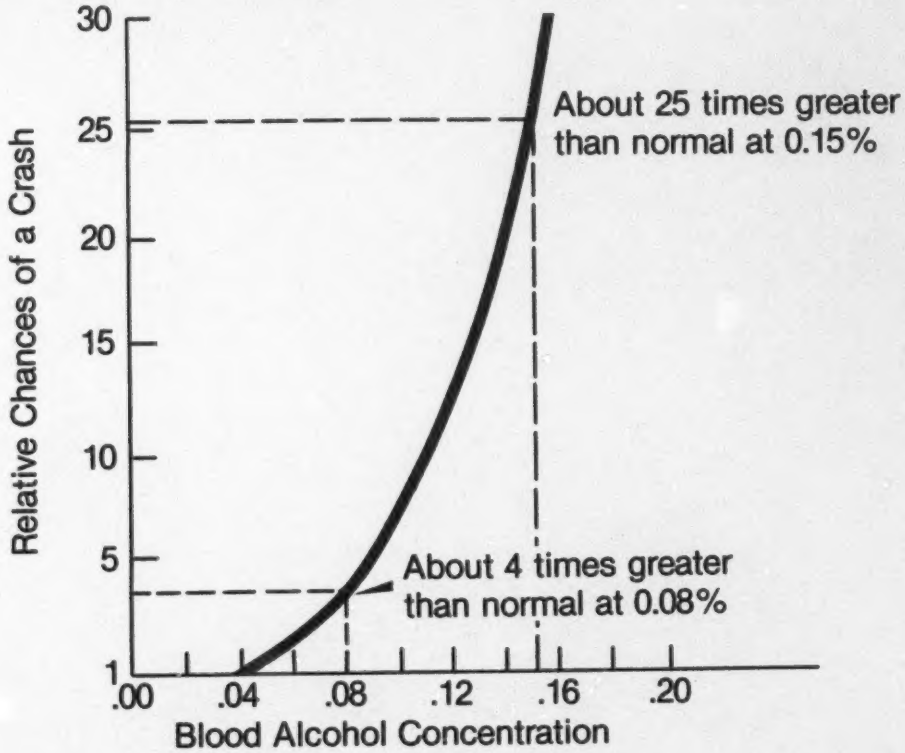
Dynamic Assignment Protocol

American Medical Association Statement of Official Policy

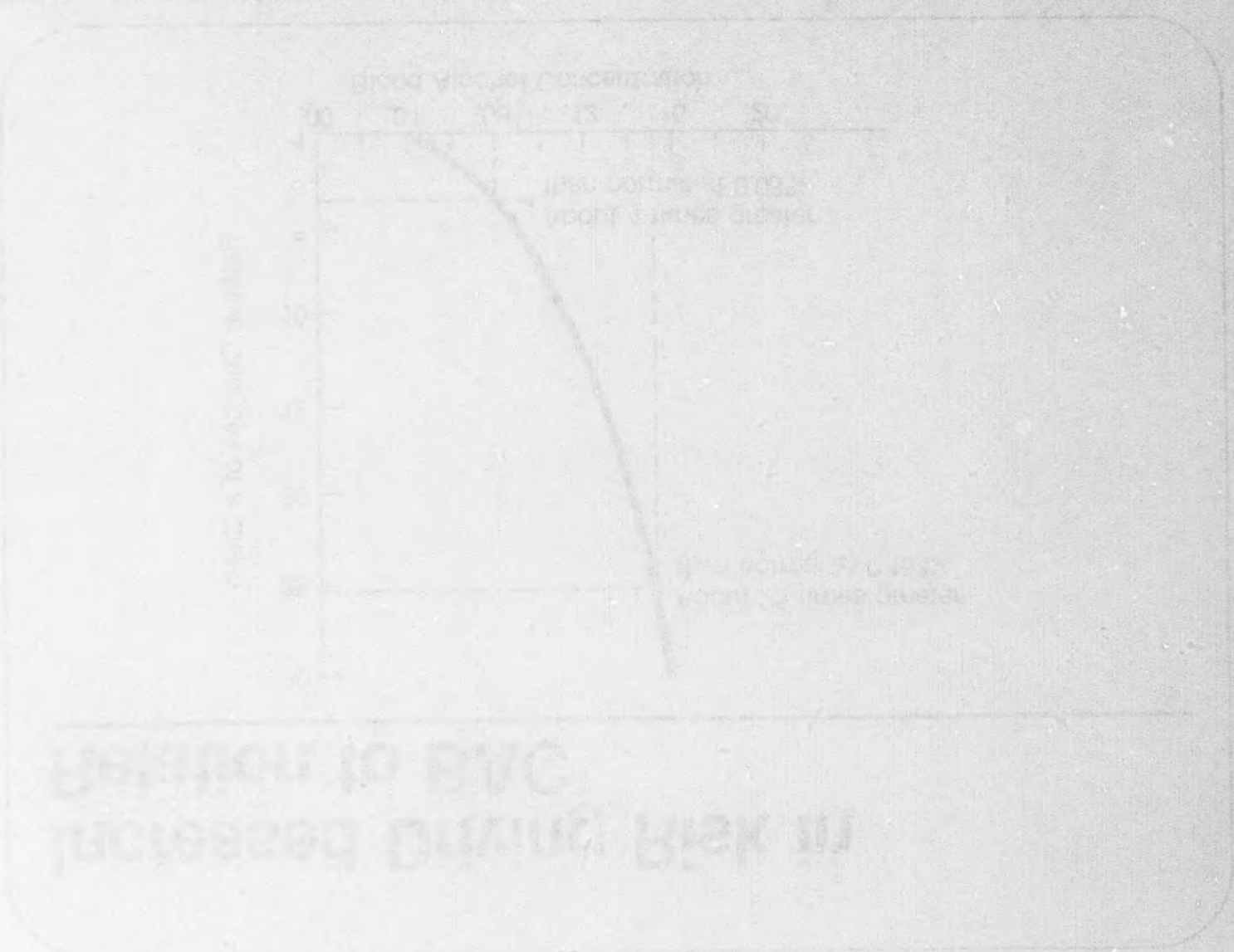
- All persons show definite loss of clearness of intellect and control when concentration is above 0.10% and should be considered under the influence.
- . . . Recommend that persons with concentration of 0.04% or less not be prosecuted.
- Many persons with concentration between 0.05% and 0.10% will be under the influence (but recommend prosecution only when alcohol influence is confirmed by other evidence).

Visual 3-1. This art has been designed for use as is with an opaque projector, or as base art for conversion into a vu-graph or 35-mm slide.

Increased Driving Risk in Relation to BAC



Visual 3-2. This art has been designed for use as is with an opaque projector, or as base art for conversion into a vu-graph or 35-mm slide.



How many shots of whiskey or bottles of beer would you have to drink in 4 hours, on an empty stomach, to reach 0.10%?

Visual 3-3. This art has been designed for use as is with an opaque projector, or as base art for conversion into a vu-graph or 35-mm slide.

Number of Drinks Needed to Reach 0.10% in a 4-hour Period

Weight	Drinks
100-120	5
121-140	6
141-160	7
161-180	8
181-200	9
201-220	10

Visual 3-4. This art has been designed for use as is with an opaque projector, or as base art for conversion into a vu-graph or 35-mm slide.

Минтранс России
Федеральное агентство железнодорожного транспорта
Ордена Трудового Красного Знамени
Ленинградский институт инженеров железнодорожного транспорта
имени академика В.Н. Образцова

Кафедра «Вагоны и вагонное хозяйство»

Дипломный проект

Специальность 190300 – Вагоны и вагонное хозяйство

Студент гр. ВТ-4 Иванов И.И.

Руководитель проекта Петров П.П.

Санкт-Петербург
2005

Body Substances That can be Analyzed to Measure BAC

- Blood
- Breath
- Urine
- Saliva
- Spinal Fluid
- Various Tissues
  (brain, lung, liver, etc.)

And, in general, any body substance that contains water.

Visual 3-5. This art has been designed for use as is with an opaque projector, or as base art for conversion into a vu-graph or 35-mm slide.

Body Substances That can be Analyzed to Measure BAC

- Blood
- Breath
- Urine
- Saliva
- Spinal Fluid
- Vitreous Tissues
- (Organ, lung, liver, etc.)

And, in general, any body substance that contains water.

Advantages of Breath Testing

- Can be conducted by non-medical personnel
- Provides immediate result
- Needs no lab services
- More acceptable to suspects

Visual 3-6. This art has been designed for use as is with an opaque projector, or as base art for conversion into a vu-graph or 35-mm slide.

Diabetes Treatment Center of Chattanooga

Wade Accepts to Enabete

Medicare and Medicaid Patients

Yd Participating Physician

(Non-participating physicians)

Factors Possibly Affecting Breath Test Accuracy

- Breath sample composition
  —Mixture of deep-lung and tidal breath
- Residual mouth alcohol
  —Remaining from drinks taken during the past 10-15 minutes
- Breath contaminants
  (Acetone, ether, chloroform, etc.)
  —That might affect some breath tests

Visual 3-7. This art has been designed for use as is with an opaque projector, or as base art for conversion into a vu-graph or 35-mm slide.

Effective Meeting Techniques

Vocational Agriculture

- Establish communication
- Identify problem
- Identify alternatives
- Select best alternative
- Implement decision
- Evaluate results

*U.S. GOVERNMENT PRINTING OFFICE: 1992-309-332:60659

Commonly Used Breath Analysis Techniques

- Oxidation photometric (color change)
- Gas chromatography
- Infrared absorption
- Electrochemical oxidation (fuel cell)
- Semiconductor

Visual 3-8. This art has been designed for use as is with an opaque projector, or as base art for conversion into a vu-graph or 35-mm slide.

U.S. Department
of Transportation
**National Highway
Traffic Safety
Administration**

Preliminary Breath Testing for Drinking-Driving Enforcement

Trainee's Manual

Preliminary Breath Testing for Drinking-Driving Enforcement

Trainee's Instructional Manual

U.S. Department of Transportation
National Highway Traffic Safety Administration

Foreword

The National Highway Traffic Safety Administration (NHTSA) is responsible for developing training programs responsive to the Uniform National Standards established by the Highway Safety Act of 1966. These programs provide guidelines for training in State and local jurisdictions having highway safety and traffic law enforcement responsibilities. NHTSA, therefore, intends that the programs be of the highest quality and that they address the high-priority training needs of agencies that provide highway safety services. An especially important training need arises when new technology becomes available to augment highway safety services.

NHTSA sponsored the preparation of this training package in response to such a technological development. Preliminary breath testing (PBT) devices provide a means of improving a police officer's ability to evaluate suspected drinking-driving violators. A reasonably accurate, reliable and easy-to-operate PBT can give an on-the-spot indication of the suspect's blood alcohol concentration (BAC) that will be an important factor in the officer's decision to arrest or not to arrest. Proper use of PBTs is expected to lead to more effective enforcement of drinking-driving laws and, in turn, to reduction of alcohol-related crashes and fatalities.

In recent years NHTSA and several private manufacturers have substantially advanced PBT technology. Several types of these devices now exist, each employing technically sound operating principles and promising reasonably accurate and reliable indications of BAC at reasonable cost. Extensive field tests of several of these PBT models have demonstrated a significant increase in enforcement effectiveness. Increased use of these devices by law enforcement agencies is anticipated. NHTSA developed this training program to provide the instruction and motivation necessary for the most effective use of PBT devices.

This training course has been designated as the Preliminary Breath Testing for Drinking-Driving Enforcement. It is a one day course comprised of six units.

Introduction

This manual is your principal study guide and reference source for the basic course in Preliminary Breath Testing for Drinking-Driving Enforcement. It provides a detailed outline of each unit of the course. These outlines list the training objectives and content of each unit. The training objectives list what you are expected to be able to do at the end of each unit. The content outline contains the information you will need to achieve the training objectives. This information will be supplemented by the instructor's classroom discussions, sample problems and exercises and hands-on practice sessions. The unit outlines also include study topics, which consist of sample problems and suggestions for reviewing the material covered.

This manual is only a basic reference document, *not* a complete text for the course. Some of the essential information for this training comes from your State, your community and your law enforcement agency. This "local" information includes the statutes and regulations concerning drinking-driving violations, policies and procedures affecting enforcement and the specific role of preliminary breath testing devices in enforcement. Your instructor will present this information in lectures and handouts as well as in the additional reference sources suggested.[1] By the end of the course, your lecture notes, handouts and reference citations, together with the content outlines of this manual, will provide you with a complete set of information about prearrest screening in your jurisdiction.

This manual will be useful to you at three different times. First, before the course, it will allow you to preview the contents, structure and sequence of units. This should make it easier to follow the presentations and discussions. Second, during the course the manual can serve as an excellent notebook. Its detailed outline should minimize the need for taking elaborate notes; instead, you will be able to concentrate on recording other key points of the instructor's lecture. Third, after the course is completed, the manual and your notes will be a reference/refresher source. If your instructor conducts a formal test, your completed manual will help you prepare for the test.

In addition, as you apply what you have learned in this course to your drinking-driving enforcement duties, you can use the manual to refresh your memory. Also, the manual can be easily updated to accommodate changes in statutes and policies. If new types of devices are adopted, information on them can be added to this manual. Making these changes will keep the manual current and useful.

[1]Since the training package was prepared by NHTSA for nationwide use, this kind of material could not have been included in the basic manual.

Unit 1
Course Overview and Introduction

This opening unit describes the basic topics of this course. It reviews the contents of the subsequent chapters and explains how those contents relate to the objectives of the course. After reviewing this first unit, you should be able to

- Describe the objectives of the course.
- Describe the concept and purpose of preliminary breath testing.
- Describe the technical scope and contents of the course.

Unit Content

Overall Course Objective

Preliminary breath testing (or prearrest screening, as it is also called) focuses on the alcohol-impaired driver—a person who has consumed enough ethyl alcohol (usually in the form of beer, wine, whiskey, or liquor) to slow his or her reactions noticeably, reduce coordination and balance appreciably and diminish judgment and inhibitions. This person has been called by many names. He or she is widely known as the "drunk driver," although the person need not be obviously or "falling down" drunk to qualify for this title. This driver is known as the "DWI," or driving while impaired, violator to many police officers; others call this person the "DUIL" or driver under the influence of liquor. By any name, the drinking driver is perhaps the greatest danger on the roads today. The alcohol-impaired driver causes a major share of our highway fatalities. Some researchers estimate that as many as 50% of all traffic deaths can be traced to a DWI violator. The following table, drawn from California fatal accident data from 1962 to 1968, gives a picture of the damage done by the DWI.

The percentages listed below do not include all drivers known to have been drinking, but *only those definitely known to have been impaired by alcohol at the time of the accident.* More than half (53%) of those accidents involved at least one driver who was known to have been drinking, although possibly not to the level at which he or she was definitely impaired.

Table 1–1

Type of fatal accident	Number of cases tested for alcohol	Percentage known to be DWI
One vehicle—driver fatally injured	2,521	56%
Vehicle strikes nonmoving vehicle—driver fatally injured	156	47%
Two moving vehicles collide—"at fault" driver killed	1,433	43%
Vehicle strikes nonmoving vehicle—nonmoving vehicle's driver injured	19	32%
Two moving vehicles collide—both drivers killed	103	30%
Two moving vehicles collide—responsibility of fatally injured driver unknown	225	19%
Two moving vehicles collide—nonresponsible driver killed	666	10%
Total, all cases	5,123	43.9%

Source: Royal A. Neilson, "Alcohol Involvement in Fatal Motor Vehicle Accidents in California—1962–68," California Traffic Safety Foundation, 1969.

Table 1-1 shows the DWI violator's part in traffic fatalities according to the California study.

More recent data from the New Hampshire Alcohol Safety Action Project (ASAP) confirm the similar high involvement in both single vehicle fatal and multiple vehicle fatal accidents in that State during the period 1972 to 1976. Examination of the two tables below indicates that 57.5% of the accidents were known alcohol related in the case of single vehicle fatalities and 13.2% in the case of multiple vehicle accidents.

As a police officer, you have a clear duty to help control the DWI problem. You are responsible for enforcing drinking-driving laws. Your enforcement responsibilities include

- *Detecting* the DWI violator.
- *Apprehending* the violator to prevent him or her from harming self or others.
- *Conducting a thorough investigation* of the apprehended violator to obtain the evidence needed to arrest and convict him or her.

This course will help you carry out this enforcement responsibility. The objective of the course is *to improve the effectiveness of drinking-driving enforcement through the proper and efficient use of preliminary breath testing instruments.* A preliminary breath testing instrument (PBT) is a portable device that can be used on the spot to test a DWI suspect's breath and obtain an indication of the concentration of alcohol in the suspect's system. The PBT is a tool you can use during *investigation* after you have stopped a possible DWI violator. The PBT can help you determine if the suspect is under the influence of alcohol—that is, it supports other evidence necessary to make an arrest.

This course will teach you how to operate a PBT and how to use the instrument in your investigations of possible DWI violators. You also will learn how to recognize other evidence of a DWI violation. After completing the course, you should be able to make more arrests of DWI violators and obtain more convictions.

As *the ultimate result,* your improved enforcement should lead to fewer motor vehicle accidents involving alcohol and, therefore, fewer deaths and injuries.

Table 1–2
Alcohol Involvement in 1972–1976 Single Vehicle Fatal Accidents by Time Period

	Time Period											
	M–4 a.m.		4–8 a.m.		8 a.m.–N		N–4 p.m.		4–8 p.m.		8 p.m.–M	
	No.	Pct*	No.	Pct*	No.	Pct*	No.	Pct*	No.	Pct*	No.	Pct*
Known alcohol related accidents	77	81.1	7	36.8	6	33.3	10	23.8	37	45.7	70	66.7
Known non-alcohol related accidents	4	4.2	5	26.3	5	27.8	12	28.6	7	8.6	8	7.6
Not determined	14	14.7	7	36.8	7	38.9	20	47.6	37	45.7	27	25.7
Total accidents	95		19		18		42		81		105	

*Percentages based on number of accidents within time period.

Table 1–3
Alcohol Involvement in 1972–1976 Multiple Vehicle Fatal Accidents by Time Period

	M–4 a.m.		4–8 a.m.		8 a.m.–N		N–4 p.m.		4–8 p.m.		8 p.m.–M	
	No.	Pct*	No.	Pct*	No.	Pct*	No.	Pct*	No.	Pct*	No.	Pct*
Known alcohol related accidents	14	48.3	2	13.3	2	5.0	11	21.6	19	33.3	18	62.1
One or both drivers zero BAC	1	3.4	8	53.3	15	37.5	18	35.3	17	29.8	4	13.8
Not determined	14	48.3	5	33.3	23	57.5	22	43.1	21	36.8	7	24.1
Total accidents	29		15		40		51		57		29	

*Percentages based on number of accidents within time period.

Source: Robert G. Ulmer and Harold H. Jacobs, "New Hampshire Alcohol Safety Action Project—Analysis of Overall Project Impact," U.S. Department of Transportation, NHTSA, Final Report, June 1977.

Concept and Purpose of Prearrest Screening

Keep the following definition in mind throughout this course:

> Preliminary breath test means a prearrest *breath test* taken during *investigation* of a possible DWI violator to obtain an indication of the person's *blood alcohol concentration.*

Blood alcohol concentration, or BAC, means the percentage of alcohol in a person's blood. A person's BAC can indicate if he or she is under the influence of alcohol. Expert medical opinion states that a person whose BAC is *one-tenth of 1%* (0.10%) or higher definitely is under the influence of alcohol as far as ability to operate a motor vehicle is concerned. Therefore, you should never hesitate to arrest a suspect for DWI if you know his or her BAC is 0.10% or higher (provided all other elements of the offense are present.) A more detailed explanation of BAC levels will be provided in the following units.

BAC is not the only indication of whether a person is under the influence. Many people will be dangerously under the influence at BACs below 0.10%. As a police officer, you should know how to recognize other indications, including the following:

- The person's *driving behavior*
  - — Weaving; changing lanes without signaling, or without any need to do so; making improper turns; driving too slowly or too fast; stopping in the roadway for no apparent reason; making jerky stops.
- The person's *speech*
  - — Slurred words; overly slow, deliberate speech; incoherent speech; mumbling.
- The person's *balance*
  - — Stumbling; unsteady walk; weaving while walking.
- The person's *eyes*
  - — Watery or bloodshot eyes; pupils dilated or slow in reacting to light.
- The person's *reactions*
  - — Slow or uncertain reactions; lack of comprehension.

You should always look for these and similar indications when investigating a possible DWI violator.

How important is prearrest screening to the investigation of a possible DWI violator? What role does prearrest screening play in the investigation?

- Prearrest screening allows you to identify and arrest many DWI violators who are under the influence and are dangerous drivers, but who are able to hide some of the usual signs of alcohol impairment.
  - — Some heavy drinkers can speak reasonably well and clearly and can maintain reasonably good balance even though they are too impaired to drive safely. Prearrest screening provides a means to support other evidence of alcohol influence in those cases.
- Prearrest screening allows you to identify individuals who may be suffering from a medical problem that produces symptoms similar to alcohol impairment.
  - — Some diabetics, persons with recent head injuries, stroke victims, persons exposed to carbon monoxide poisoning and other individuals may appear to be under the influence of alcohol but actually have had nothing to drink. Prearrest screening can help to protect these persons by calling your attention to the fact that they need prompt medical care.

In general, the purpose of prearrest screening is to help you decide whether a suspect should be arrested for DWI. PBTs are tools that will help you make this decision. PBTs are *not* intended to replace your judgment. You don't need to use your PBT if it is clear to you that the suspect is or is not under the influence of alcohol. But you should not hesitate to use the PBT if there is any doubt about whether to make the arrest.

Although prearrest screening is not the sole basis for a DWI investigation, it plays an important

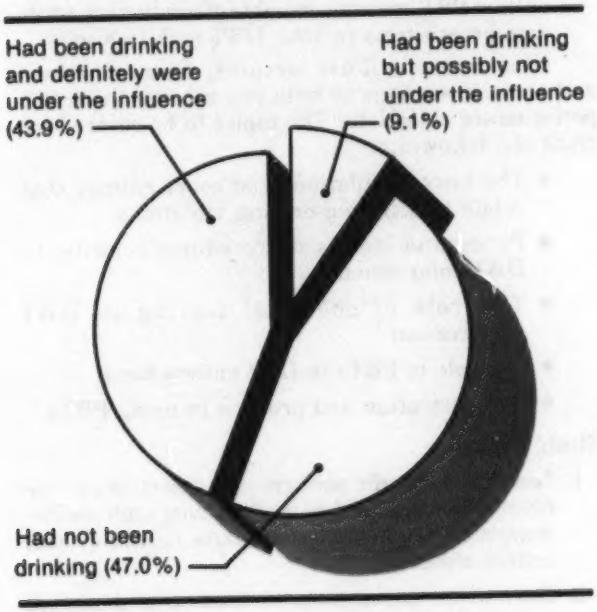

Had been drinking and definitely were under the influence (43.9%)
Had been drinking but possibly not under the influence (9.1%)
Had not been drinking (47.0%)

Figure 1. Drivers in fatal crashes

role in improving enforcement effectiveness. Generally speaking, when PBT instruments are used properly—

- The *number of DWI arrests increases.* The number of DWI arrests increases because officers receive immediate feedback on BAC levels to support other evidence.
- The *average BAC among arrested violators decreases.* The average BAC among arrested violators decreases because officers are better able to identify persons with lower BACs.
- The *PBT instruments perform reasonably accurately and reliably,* and officers find they can trust the instruments as tools to aid their judgment.
- The *PBT instruments are well accepted by officers,* who become increasingly willing to use the PBT, when needed, to aid their judgment.

Performance Objectives, Scope and Content

To improve the effectiveness of DWI enforcement, this course must somehow affect your ability to do your job. That is, you must learn how to perform certain tasks that are essential for the proper application of prearrest screening in DWI enforcement. The *specific performance objectives* which you are expected to achieve throughout this course include the ability to:

1. *Describe the purpose, benefits and effectiveness of PBTs for drinking-driving enforcement.* By achieving this objective, you will understand the role that prearrest screening should play in the investigations you conduct. This understanding should encourage you to use your PBT when necessary.

2. *Identify and describe the laws, regulations, policies and procedures that affect drinking-driving enforcement in general and prearrest screening in particular.* This objective will help you understand the legal and operational framework surrounding DWI enforcement and prearrest screening. You will become familiar with *all* the facts that must be established to convict a suspect of DWI, and you will see how prearrest screening applies to some of these facts but not to others. You will learn when to use a PBT, when you should *not* use it and when you may have discretion over its use. Most importantly, you will learn the legal and operational constraints that govern prearrest screening so that your use of a PBT will not violate a suspect's rights or jeopardize your case against a DWI violator.

3. *Describe the basic principles and types of chemical tests used in drinking-driving enforcement.* This objective will help you understand and appreciate the scientific basis of prearrest screening. A knowledge of chemical testing principles, especially those that apply to breath testing, will ensure that you recognize BAC as a reliable indicator of a person's alcohol impairment. You will also learn how a hand-held instrument can provide a valid measurement of BAC. A knowledge of breath testing principles also will help to make sure that you operate your PBT as accurately as possible.

4. *Identify the PBT instrument you will use for prearrest screening and describe its operating characteristics, accuracy and reliability.* This objective will help you understand and take proper care of the particular PBT instrument you will be using. You should know *how* your instrument works so that you can trust it. You should also know how to make sure it is working properly and how to perform at least some simple preventive maintenance. Finally, you should be aware of your PBT's normal accuracy and reliability characteristics so that you realistically evaluate the information it provides.

5. *Demonstrate and apply the basic skills required to operate the PBT instrument that you will use.* Finally, by achieving this objective, you will learn how to conduct breath tests. All PBT instruments are simple to operate, but you must perform the operating steps in a certain way. After this course is completed you will be a skilled PBT operator, capable of conducting accurate breath tests in your DWI investigations.

This course will use lectures, demonstrations and practice sessions to help you achieve these five performance objectives. The topics to be covered include the following:

- The laws, regulations and court rulings that relate to drinking-driving violations.
- Policy and standard procedures relating to DWI enforcement.
- The role of chemical testing in DWI enforcement.
- The role of PBTs in DWI enforcement.
- Demonstration and practice in using PBTs.

Study Topics

1. Learn the specific performance objectives of the course. Be prepared to explain how each performance objective will contribute to the overall course objective.
2. Review the concept and definition of prearrest screening. Be prepared to discuss the ways in which prearrest screening should help to improve DWI enforcement.

3. Be prepared to answer the following questions:

   a. What does "blood alcohol concentration" mean?

   b. Why should prearrest screening help to *reduce* the average BAC among persons arrested for DWI?

   c. When should a PBT instrument *not* be used in a DWI investigation?

   d. According to most medical and scientific experts, at what BAC level is a person considered to be definitely under the influence of alcohol?

   e. What ultimate result do we hope to achieve by improving drinking-driving enforcement?

   f. How can a prearrest screening test help you identify a person who needs prompt medical attention (such as a victim of a stroke or carbon monoxide poisoning)?

Unit 2
The Legal and Operational Environment

Within your jurisdiction, DWI enforcement is restricted by a variety of statutes, case rulings, regulations and policy statements. We might loosely refer to the offense as "drunk driving," but in reality DWI is a specific charge that has certain definite *elements*, or facts, that you must establish to secure a conviction. To establish those elements, you must collect *evidence*. There are definite rules that determine whether evidence is relevant and admissible in court. In the case of DWI, you must know which elements have to be established, what types of evidence can be used, and the rules that govern collection of that evidence. Without this knowledge, you may fail to secure a conviction because of insufficient evidence. It is important that you understand the rules that affect prearrest screening, so that you use your PBT without violating the suspect's rights or jeopardizing successful prosecution of the case.

This unit will refresh and expand your knowledge of the legal and operational environment affecting DWI enforcement, with special emphasis on the laws, regulations and policies pertaining to prearrest screening. By the end of the unit, you will be expected to be able to

- Identify the statutes defining and relating to drinking-driving violations.
- Describe the elements of these drinking-driving violations.
- Describe the legal basis for and restrictions concerning prearrest screening.
- Describe court rulings that have had an effect on drinking-driving enforcement and prearrest screening.
- Describe law enforcement regulations, policies and procedures concerning drinking-driving enforcement and prearrest screening.

Unit Content

Note: The topics of this unit largely are based on the laws, regulations, court rulings, policy and procedures of *your* jurisdiction. Different jurisdictions have somewhat different DWI statutes and somewhat different DWI enforcement procedures and policies regarding prearrest screening. Your instructor will give you much of the written material concerning these topics. You should incorporate handout material into this manual to retain it for future study. The content material provided below is only a general outline of the legal and operational environment.

Elements of the DWI Offense

The elements of any offense are the facts that must be established to secure a conviction. You must have probable cause to believe those elements are present before you can make a lawful arrest.

In the case of DWI, the elements of the offense usually include the following:

- The *operation or control* of the vehicle.
  - — Although we speak loosely of drunk *driving* or *driving* while under the influence, the DWI laws of most States do not require that the suspect actually be seen driving the vehicle (that is, be seen in motion along the road). It usually is enough to establish that the suspect is *operating or physically controlling* the vehicle. The exact meaning of the term "operation or physical control" is subject to the court's interpretation; however, it usually is enough to show that the suspect was seated behind the wheel with the key in the ignition switch to establish that he or she was operating or physically controlling the vehicle. You should become familiar with how the courts have interpreted this element and always obtain sufficient evidence to establish operation or physical control of the vehicle by the suspect.
- The *type of vehicle* involved in the offense.
  - — The vast majority of DWI violations involve a standard passenger automobile, but this is not always the case. There are many types of vehicles that can be operated on roads or elsewhere—for example, bicycles, horse- or ox-drawn carts, snowmobiles, motorcycles, motor-assisted bicycles, vehicles that travel on tracks (such as trains

and trolleys) and many others. Depending on the wording and interpretation of your State's statutes, some of these vehicles may be excluded from the DWI offense. You must obtain evidence showing that the offense involved a vehicle that is covered by the law.

- The *location* where the offense is alleged to have been committed.
  - — The offense of DWI may or may not apply everywhere in the State, depending on the exact wording of the statute and how it has been interpreted by the courts. In some States, DWI must occur on a public street, road or highway before an arrest can be made. Other States include certain types of private roads or other areas in their DWI laws. Still other State laws place no restriction on location; DWI can take place and arrests can be made anywhere in the State. However, "location" is an element of the offense of DWI in many States, and as the arresting officer you must obtain sufficient evidence to show that the offense occurred at a place that falls within the scope of the law.
- The *influence of alcohol.*
  - — Establishing that the suspect is under the influence of alcohol or impaired by alcohol within the meaning of the law obviously is an element of DWI. However, the specific legal meaning of "under the influence" may not be precisely defined. In all States, there is good agreement that the suspect need *not* be drunk or intoxicated (as those terms are commonly understood) to be under the influence. It usually is enough to show that alcohol has affected the person's ability to operate a vehicle safely.
  - — Some States have carried their laws a step farther by defining a precise scientific level of under the influence. These States have made it an offense to operate a motor vehicle while having a BAC that equals or exceeds some specified level. Such statutes often are referred to as "illegal per se" laws, from the Latin expression for "by itself"; that is, it is an offense *by itself* (per se) to operate a vehicle with a BAC of x% or more, regardless of whether the suspect is drunk, impaired or under the influence at that BAC. In States that have an "illegal per se" law, the BAC level is itself an element of the offense, not merely evidence that supports an element.
  - — States that have an "illegal per se" law usually also have the more familiar DWI law in which under the influence is an element. Thus, a person arrested for DWI could still be prosecuted even if it is not possible to obtain a BAC measurement, provided there is other sufficient evidence of alcohol impairment.
  - — Remember that even if your State has an "illegal per se" law, an admissible measurement of the suspect's BAC usually will not be available until after the arrest. Thus, to obtain probable cause for a lawful arrest you must be able to show that the suspect was under the influence just as you would if there were no "illegal per se" law.

To summarize, the DWI offense usually has four elements. It is never enough to show simply that the suspect's BAC exceeds some level. You also must establish that he or she was operating a vehicle covered by the law at a location covered by the law. And, it always is best to gather as much evidence of the suspect's alcohol impairment as possible. If you base your case solely on the suspect's BAC, conviction very likely might not occur. However, as discussed below, an indication or measurement of BAC can be helpful to your case when it is obtained along with other evidence.

The Role of BAC Measurement in DWI Cases

A BAC measurement or indication applies only to one of the four elements of DWI (the "alcohol influence" element) and is not the only evidence of that element. But it is very important evidence and many cases would be lost without it. A BAC measurement is obtained through a *chemical test*. Depending upon when, where and by whom the chemical test is administered, the BAC measurement may or not be admissible in court. BAC measurement can play two roles in DWI cases:

- It can be admitted into evidence in court in support of the alcohol influence and/or "illegal per se" element of the offense.
- It can be obtained prior to arrest to help secure probable cause to believe that the suspect is under the influence.

Although the second role is of primary interest in this course, both warrant some discussion.

The DWI laws of every State permit the results of a chemical test (or tests) of BAC to be admitted as evidence in court to support or refute a charge of DWI. To be admissible, it usually must be true that

- The test was conducted using an approved method and testing instrument.
- The test was administered by a qualified person.

- The test was administered after the suspect's arrest for DWI (or related charges arising out of acts alleged to have occurred while the suspect was operating under the influence).
- The arrest was lawful and the suspect was advised of his or her rights relative to the chemical test.

In most States a valid, admissible BAC measurement is considered to be *presumptive evidence* of or against alcohol impairment. Typically, the law will treat

- A BAC of 0.10% or higher as giving rise to the presumption that the person is under the influence.
- A BAC of 0.05% or less as giving rise to the presumption that the person is not under the influence.
- A BAC of more than 0.05% but less than 0.10% as giving rise to no presumption, but as competent evidence along with other evidence in determining whether the person is under the influence.

(Other limits, distinct from 0.10% and 0.05%, may apply in some States. Learn the limits in your State by reviewing the State laws and other material provided by your instructor.)

To help obtain chemical tests of BAC on DWI arrestees, every State has enacted its own version of an *implied consent law.* The wording of the law varies from State to State, but the law generally contains a statement similar to the following:

> Any person who operates a motor vehicle within this State is deemed to have given consent to a chemical test. . . for the purpose of determining blood alcohol concentration, if lawfully arrested for. . . operating under the influence.

In effect the implied consent law states that the very act of operating a motor vehicle creates an agreement between the State and the motorist, in which the motorist promises to submit to a chemical test if arrested for DWI. If the motorist is arrested and refuses the test, he or she violates the agreement and, therefore, the State may punish the motorist. The usual punishment for refusing the chemical test in most States is a license suspension/revocation; some States impose a fine in addition to or in lieu of the license penalty. The purpose of the punishment is to encourage DWI arrestees to comply with your request for a chemical test.

Some States have an *expressed consent law* in addition to an implied consent statute. Under expressed consent, a person receiving a driver's license signs a formal written agreement to submit to a chemical test if arrested for DWI. This may be more effective in securing compliance with the chemical test request, but it applies only to drivers licensed in that State. Implied consent applies to all operators, including out-of-State and unlicensed drivers.

Remember that implied or expressed consent and the formal chemical test apply only *after* you have made a DWI arrest. Thus, you must already have probable cause to believe the suspect is under the influence (and that all other elements of the offense are present) before you can invoke implied consent to obtain a BAC measurement for admission in court. That is, the implied consent law does *not* help you decide whether or not to arrest for DWI.

The second role of BAC measurement—supporting other evidence—comes into play through prearrest screening. In most cases, you will have reason to believe that the person has been drinking, and you usually will have some evidence that his or her driving is unsafe. The preliminary breath test will help you decide if the suspect is under the influence and if the arrest should be made. In most States, the result of a preliminary breath test is not admissible in court. Thus, the PBT is strictly an investigatory tool and does not provide *evidence,* as such.

State laws governing prearrest screening vary widely. Some States have enacted prearrest screening statutes similar to the implied consent formulation; that is, motor vehicle operators are deemed to have consented to a preliminary breath test when requested to do so by a police officer having reason to believe the suspect has alcohol in his body and face license action or other punishment should they subsequently refuse the test. Other States' laws call for prearrest screening in certain circumstances; for example, during motor vehicle accident investigations and traffic violation stops. Many States have no explicit laws concerning prearrest screening but that does not mean that PBTs cannot be used; it might mean, however, that a suspect can refuse the PBT without penalty.

Remember that a preliminary breath test is intended to be used before the arrest. Its purpose is to help you determine if the suspect is under the influence of alcohol.

DWI Enforcement Policies and Procedures

Policies and procedures differ among law enforcement agencies. These differences are absolutely proper, because each agency must determine the relative emphasis to be devoted to the various traffic safety problems and other duties. Nevertheless, some general guidelines common to all agencies can be set forth.

- General DWI arrest policy.
  - — You will arrest any suspect whenever there is probable cause to believe the suspect has committed a DWI violation.
  - — You should not release such a suspect or arrange for alternate transportation of the suspect in lieu of arrest.

- General prearrest screening policy.
  - — You will use PBT instruments to *assist* investigation of possible DWI violators as necessary and appropriate.
  - — As a first corollary to this general statement, you are expected to conduct a thorough and complete investigation to obtain *all* possible evidence concerning the suspect's alcohol impairment. You will *not* base your investigation solely on the PBT instrument.
  - — As a second corollary, you should attempt to use the PBT whenever you have reason to believe the suspect has been drinking, but evidence of alcohol impairment is not compelling.

To help you implement this policy, the appendix to this unit lists visual and other clues of possible alcohol impairment.

Study Topics

1. Review the statutes and regulations affecting DWI violations in your State. Be prepared to discuss the elements of the DWI offense.
2. Review the statutes and regulations affecting prearrest screening in your State. Be prepared to describe a suspect's rights and obligations relative to a Preliminary Breath Testing.
3. Learn the clues of possible alcohol impairment listed in the appendix to this unit.
4. Be prepared to answer the following questions:
   a. When should you *not* request a suspect to submit to a preliminary breath test?
   b. Can a lawful arrest for DWI be made in the parking lot of a private social club? (Justify your answer.)
   c. Can a lawful arrest for DWI be made of a suspect who is observed pedaling a moped (motorized bicycle) with the motor shut down? (Justify your answer.)
   d. Under what circumstances will a BAC measurement be admissible in court as evidence of a DWI violation?
   e. Is it lawful to arrest a suspect for DWI if a preliminary breath test indicates his or her BAC is less than the State's presumptive (per se) level? (Justify your answer.)
   f. Name five different *driving actions* that might be clues of alcohol impairment.

Unit 2—Appendix

Following are 20 cues which police officers may use to detect nighttime drunk drivers. The cues were developed from interviews with a variety of law enforcement specialists in DWI detection; from a detailed analysis of more than 1,000 DWI arrest reports from different geographical regions; and from a field study in which cues observed in more than 600 patrol stops were correlated with driver BAC levels. These cues represent the most systematically developed method available for visually predicting whether a vehicle operated at night is being driven by a DWI driver or a sober driver.

An illustrated booklet listing the cues is available free of charge from:

National Highway Traffic Safety Administration,
Administrative Operations Division,
Room 4423, 400 7th Street, S.W.,
Washington, D.C. 20590.

Ask for, *Guide for Detecting Drunk Drivers at Night.* (DOT HS 805 711).

Probability Values

The number given after each visual cue is the probability that a driver exhibiting that cue has a BAC equal to or greater than 0.10%. For example, the 65 for the first cue, **Turning With Wide Radius,** means that chances are 65 out of 100 that a driver who turns with wide radius at night will have a BAC equal to or greater than 0.10%. The 50 for **Drifting** means that chances are 50 out of 100 (50:50) that a driver who is drifting at night will have a BAC equal to or greater than 0.10%.

Each value shown is based on seeing only one cue. However, multiple cues are seen more often than single cues. When two or more cues are seen, add 10 to the largest value among the cues observed.

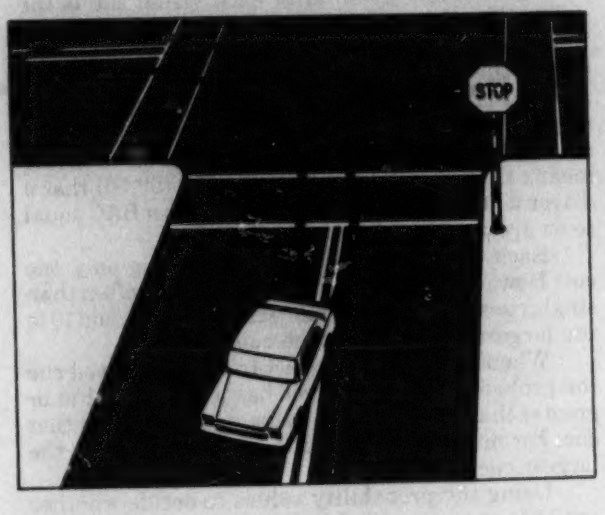
When you want to predict from an observed cue the probability that a driver has a BAC equal to or greater than 0.05%, add 15 to the value shown for that cue. For multiple cues, add 15 after adding 10 to the largest cue value.

Using the probability values to decide whether or not to stop a particular driver will be a matter of departmental policy and/or officer judgment. The Guide is only an aid that provides information concerning which visual cues are most likely to indicate a drunk driver at night.

Visual Cue Descriptions

65% Turning With Wide Radius

During a turn, the radius defined by the distance between the turning vehicle and the center of the turn is greater than normal.



65% Straddling Center or Lane Marker

The vehicle is moving straight ahead with the center or lane marker between the left-hand and right-hand wheels.

60% Appearing to be Drunk

This cue is actually one or more of a set of indicators related to the personal behavior or appearance of the driver. Examples of specific indicators might include:

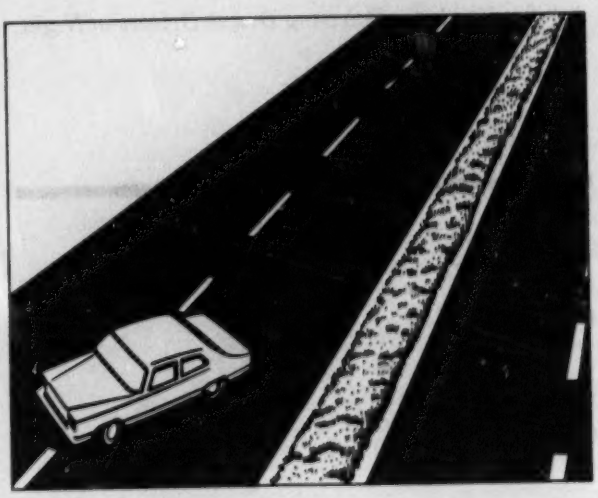
- Eye fixation
- Tightly gripping the steering wheel
- Slouching in the seat
- Gesturing erratically or obscenely
- Face close to the windshield
- Drinking in the vehicle
- Driver's head protruding from vehicle

60% Almost Striking Object or Vehicle

The observed vehicle almost strikes a stationary object or another moving vehicle. Examples include: passing abnormally close to a sign, wall, building, or other object; passing abnormally close to another moving vehicle; and causing another vehicle to maneuver to avoid collision.

60% Weaving

Weaving occurs when the vehicle alternately moves toward one side of the roadway and then the other, creating a zig-zag course. The pattern of lateral movement is relatively regular as one steering correction is closely followed by another.

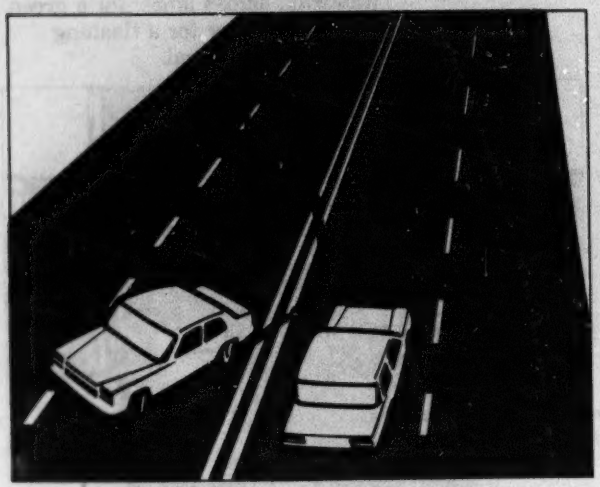


55% Driving on Other Than Designated Roadway

The vehicle is observed being driven on other than the roadway designated for traffic movement. Examples include driving: at the edge of the roadway, on the shoulder, off the roadway entirely, and straight through turn-only lanes or areas. The last example is illustrated below.

55% Swerving

A swerve is an abrupt turn away from a generally straight course. Swerving might occur directly after a period of drifting when the driver discovers the approach of traffic in an oncoming lane or discovers that the vehicle is going off the road; swerving might also occur as an abrupt turn is executed to return the vehicle to the traffic lane. In the illustration below, a swerve was executed to return to a lane after a period of drifting toward opposing traffic.



50% Speed Slower Than 10 M.P.H. Below Limit

The observed vehicle is being driven at a speed that is more than 10 MPH below the speed limit.

50% Stopping Without Cause in Traffic Lane

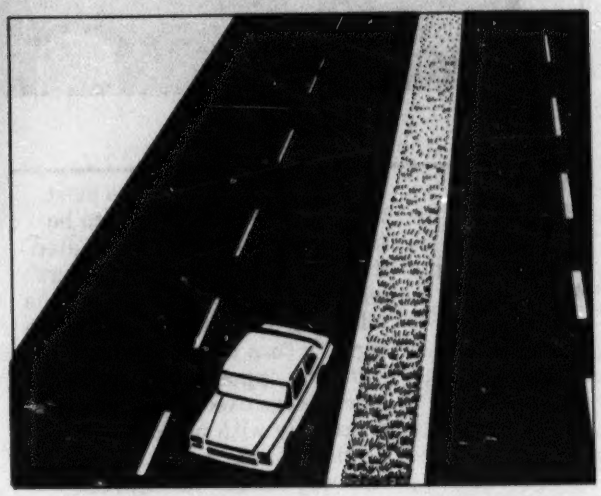
The critical element in this cue is that there is no observable justification for the vehicle to stop in the traffic lane; the stop is not caused by traffic conditions, traffic signals, an emergency situation, or related circumstances. Intoxicated drivers might stop in lane when their capability to interpret information and make decisions becomes severely impaired. As a consequence, stopping (without cause) in the traffic lane is likely to occur at intersections or other decision points.

50% Following Too Closely

The vehicle is observed following another vehicle while not maintaining the legal minimum separation.

50% Drifting

Drifting is a straight-line movement of the vehicle at a slight angle to the roadway. As the driver approaches a marker or boundary (lane marker, center line, edge of the roadway), the direction of drift might change. As shown in the illustration, the vehicle drifts across the lane marker into another lane, then the driver makes a correction and the vehicle drifts back across the lane marker. Drifting might be observed within a single lane, across lanes, across the center line, onto the shoulder, and from lane to lane.



45% Tires on Center or Lane Marker

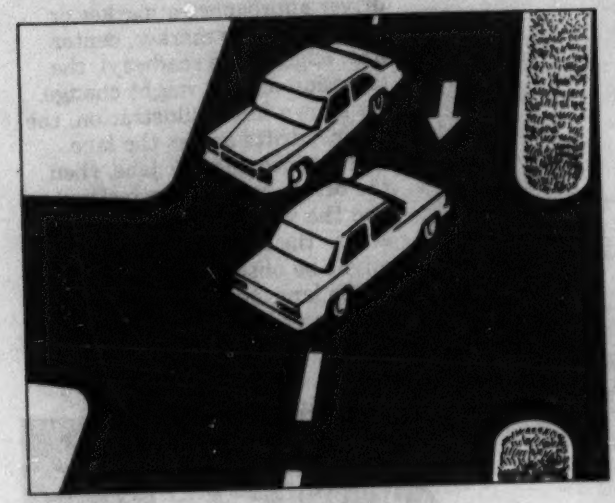
The left-hand set of tires of the observed vehicle is consistently on the center line, or either set of tires is consistently on the lane marker.

45% Braking Erratically

The driver of the observed vehicle breaks unnecessarily, maintains pressure on the brake pedal ("riding the brakes"), or brakes in an uneven or jerky manner.

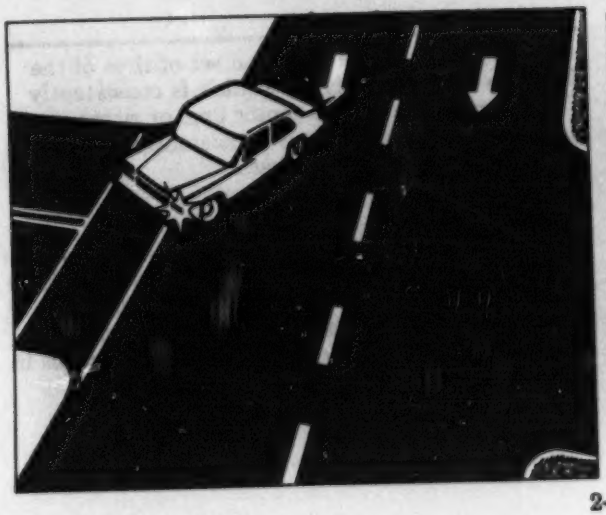
45%
Driving Into Opposing or Crossing Traffic

The vehicle is observed heading into opposing or crossing traffic under one or more of the following circumstances: driving in the opposing lane; backing into traffic; failing to yield the right-of-way; driving the wrong way on a one-way street. The last circumstance is illustrated below.



40%
Signaling Inconsistent With Driving Actions

A number of possibilities exist for the driver's signaling to be inconsistent with the associated driving actions. This cue occurs when inconsistencies such as the following are observed: failing to signal a turn or lane change; signaling opposite to the turn or lane change executed; signaling constantly with no accompanying driving action; and driving with four-way hazard flashers on.

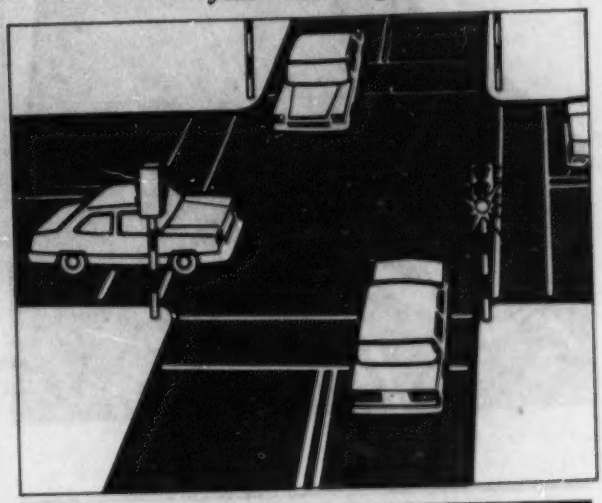


40%
Slow Response to Traffic Signals

The observed vehicle exhibits a longer than normal response to a change in traffic signal. For example, the driver remains stopped at the intersection for an abnormally long period of time after the traffic signal has turned green.

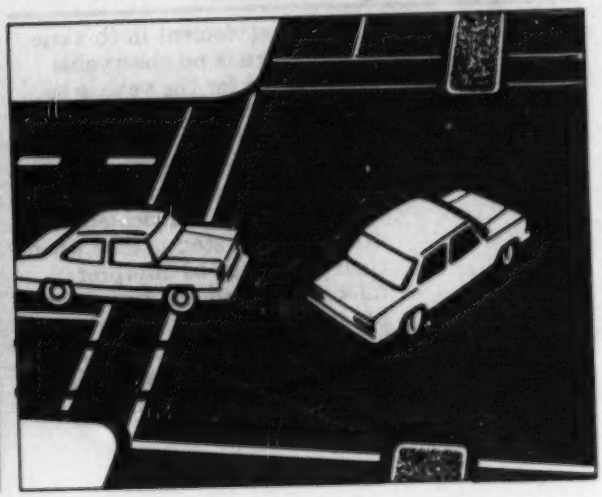
35%
Stopping Inappropriately (Other Than in Traffic Lane)

The observed vehicle stops at an inappropriate location or under inappropriate conditions, other than in the traffic lane. Examples include stopping: in a prohibited zone; at a crosswalk; far short of an intersection; on a walkway; across lanes; for a green traffic signal; or for a flashing yellow traffic signal.



35%
Turning Abruptly or Illegally

The driver executes any turn that is abnormally abrupt or illegal. Specific examples include: turning with excessive speed; turning sharply from the wrong lane; making a U illegally; turning from outside a designated turn lane.



30% Accelerating or Decelerating Rapidly	This cue encompasses any acceleration or deceleration that is significantly more rapid than that required by the traffic conditions. Rapid acceleration might be accompanied by breaking traction; rapid deceleration might be accompanied by an abrupt stop. Also a vehicle might alternately accelerate and decelerate rapidly.

30% Headlights Off	The observed vehicle is being driven with both headlights off during a period of the day when the use of headlights is required.

Unit 3
Overview of Chemical Testing

A preliminary breath test is a chemical test that indicates a suspect's BAC. If the BAC is above a certain level, we assume that the suspect is under the influence of alcohol. Arresting a person for DWI is a very serious step. Before we take that step, we should seriously question the key assumptions of the concept of prearrest screening. First, can we be sure that a person is under the influence simply because BAC is above a particular level? Is *everyone always* impaired to an unsafe degree at 0.10% BAC? Second, can we be sure that a chemical test, especially a preliminary breath test, will measure BAC accurately?

This unit addresses these questions. Upon completion you will be able to

- Describe the purpose and importance of chemical testing for drinking-driving enforcement.
- Identify the general types of chemical tests of BAC.
- Describe the basis for the validity of breath testing.
- Identify the general techniques used to analyze breath samples.

Unit Content

BAC as an Indicator of Alcohol Impairment

When you make a DWI arrest, you are stating in effect that the suspect's ability to operate a motor vehicle has become impaired to an unsafe degree. Operation of a motor vehicle is a complex task that involves a person's

- *Eyesight* (and other senses), which provides information on which driving decisions and actions will be based.
- *Judgment*, which determines decisionmaking ability and the degree and types of driving risks the driver is willing to take.
- *Reactions*, which affect quick response to information.
- *Coordination*, which determines how smoothly and correctly driving actions are taken.

Alcohol degrades all of these faculties. A person who is influenced by alcohol will have diminished eyesight, especially night vision, and he or she may experience blurring and double vision. Judgment is reduced, decisions are somewhat poorer and greater risk taking often occurs. Reaction time is slowed even after drinking moderate amounts of alcohol. Also coordination and balance suffer. Of course, all these effects become more pronounced as alcohol intake increases.

Ideally, we would measure a person's driving ability *directly*. That is, we would like to determine directly how much reactions are slowed, judgment is reduced, coordination is impaired and eyesight is diminished. But this kind of measurement is extremely difficult to do under ideal circumstances, let alone under conditions that exist on the roadside. Therefore, we must evaluate impairment *indirectly*. We listen to the suspect's speech to determine whether it is slurred. We watch the person walk to see if he or she staggers or stumbles. We try to smell the suspect's breath to detect a strong odor of an alcoholic beverage. And, when necessary and appropriate, we try to obtain an indication of BAC.

Blood alcohol concentration is not a *direct* measure of alcohol influence. Knowing a person's BAC does not tell us exactly how much reactions are slowed or judgment is reduced. BAC does not tell us exactly how unsafe the person's driving has become. Alcohol does not affect all people in exactly the same way at all times. If two people have the same BAC, their reactions, judgment, coordination and eyesight probably will not be diminished to the same degree. You probably know people who become noticeably affected by just one drink and you may know others who can consume several drinks without showing any effects. People can be impaired differently at a given BAC.

Nevertheless, we can use BAC as an *indirect* measure of alcohol impairment. A great deal of research has shown that it is possible to estimate the chances that the average person will be an unsafe driver at a certain BAC. For example, at a fairly low BAC, research shows that very few people are under the influence to an unsafe degree. At a somewhat higher level, perhaps half the people are under the

influence. At a still higher BAC level, perhaps three out of four persons are unsafe drivers. Finally, as BAC increases, a point is reached at which *everyone* is under the influence to an unsafe degree; some people will be much more impaired at that level than others, but *all* will be too impaired to drive safely.

What BAC level should we select as the indicator of alcohol impairment? Some European countries have taken a very restrictive approach: They have set a legal limit at a BAC of 0.03%. Research has shown that most people will reach this level after only one or two drinks and that only a small percentage of people will be dangerously impaired at that level. Other countries have set their limits at 0.05%; at this level, many people begin to show some effects of alcohol, although relatively few are impaired to an unsafe degree. Most British Commonwealth countries and some of our own States have set the limit at 0.08%. This is a reasonably prudent level, because a substantial majority of persons will be dangerously impaired at that point and virtually all will show at least some effects of alcohol. Most States have set the limit at 0.10%. This definitely is a *conservative* level: Research clearly shows that *all* persons are under the influence by the time BAC reaches 0.10% and that no one can claim to be an acceptably safe driver at that point.

We can demonstrate that 0.10% is a conservative level in several ways. First, most people must consume fairly large amounts of alcohol before they reach 0.10%. The amount necessary depends on how much the person weighs, how much time he or she spends drinking, whether the stomach is empty or full of food and several other factors. But even if a person drinks on an empty stomach, he or she will have to consume more than a moderate amount to reach 0.10% as the following table shows.

Number of Drinks Needed to Reach 0.10% BAC
(Assumes drinks are consumed on an empty stomach during a 4-hour period)

Weight (pounds)	Number of Drinks*
100-120	5
121-140	6
141-160	7
161-180	8
181-200	9
201-220	10
221-240	11

*Note: The term "drink" as used in this table refers to a normal, average-sized "dose" of some alcoholic beverage. For beer, one drink usually means one 12-ounce bottle or can. For wine, one drink is usually a 4- or 5-ounce glass. For distilled spirits (whiskey, vodka, rum, etc.) one drink is a 1.5 ounce "shot," often blended with water, juice, carbonated mixer, etc. All of these drinks contain approximately the same amount of alcohol. As far as BAC is concerned, a bottle of beer, a glass of wine and a highball have the same effect.

If the drinking is done on a full stomach or during a period of more than 4 hours, even more alcohol must be consumed to reach 0.10%. Therefore, if a DWI suspect has a BAC of 0.10% or more, you can be absolutely certain that he or she has done a good deal of drinking. The suspect may insist, as many do, that he or she has only had "two beers," but you can be sure that the person has had much more than that, probably four or five times as much.

Exhibit 3-1 is a handy guide to estimate the BAC that a person will have after consuming a certain number of drinks.

Another indication of the reasonableness and conservatism of the 0.10% level is found in motor

Exhibit 3–1

Estimated BAC in Relation to Body Weight and Number of Drinks for One Hour:

Body weight (lbs)	Number of drinks											
	1	2	3	4	5	6	7	8	9	10	11	12
100	.038	.075	.113	.150	.188	.225	.263	.300	.338	.375	.413	.450
110	.034	.066	.103	.137	.172	.027	.241	.275	.309	.344	.379	.412
120	.031	.036	.094	.125	.156	.188	.219	.250	.281	.313	.344	.375
130	.029	.058	.087	.116	.145	.174	.203	.232	.261	.290	.320	.348
140	.027	.054	.080	.107	.134	.161	.188	.214	.241	.268	.295	.321
150	.025	.050	.075	.100	.125	.151	.176	.201	.226	.251	.276	.301
160	.023	.047	.070	.094	.117	.141	.164	.188	.211	.234	.258	.281
170	.022	.045	.066	.088	.110	.132	.155	.178	.200	.221	.244	.265
180	.021	.042	.063	.083	.104	.125	.146	.167	.188	.208	.229	.250
190	.020	.040	.059	.079	.199	.119	.138	.158	.179	.198	.217	.237
200	.019	.038	.056	.075	.094	.113	.131	.150	.169	.188	.206	.225
210	.018	.036	.053	.071	.090	.107	.125	.143	.161	.179	.197	.215
220	.017	.034	.051	.068	.085	.102	.119	.136	.153	.170	.188	.205
230	.016	.032	.049	.065	.081	.098	.115	.130	.147	.163	.180	.196
240	.016	.031	.047	.063	.078	.094	.109	.125	.141	.156	.172	.188

vehicle accident data. Researchers conducted a large-scale study of drivers involved in motor vehicle accidents and compared their BACs with those of similar, randomly selected drivers who were *not* involved in accidents. The researchers wanted to know if the accident group contained more drivers at a given BAC than the random group; for example, if they found that at a BAC of x%, there were twice as many drivers in the accident group as in the random group, then they could say that the average driver is twice as likely to have a crash at x% BAC than he or she would if sober. In other words, chances of crashing would have doubled: The drunk driver would be twice as dangerous as normal.

The researchers learned that up to about 0.04% BAC there were as many drivers in the random group as in the accident group. So at BACs of 0.04% or less, the average driver doesn't seem to be much more dangerous than normal. But at 0.06% BAC the accident group had twice as many drivers; that is, at this BAC the average driver's risk has *doubled*. At 0.08%, *four times* as many drivers were found in the accident group. At 0.10%—the legal limit in most States—the average driver's chances of crashing are *six times* greater than normal. At levels above 0.10%, the average driver's risk increases extremely sharply. At 0.15% BAC he or she is *25 times* more dangerous than normal! At 0.18% the chances of a crash are *60 times* what they ordinarily would be! Exhibit 3-2 summarizes these findings in graphic form. That graph shows some very important points:

- First the present legal limit of 0.10% (in most States) tolerates a very sizable risk; we wait until the average driver has consumed enough alcohol to become six times more dangerous than normal before presuming he or she is under the influence.

The table shows the estimated percentage of alcohol in the blood for number of drinks consumed and different body weights. The percentage can be estimated by doing the following:

1. Count the drinks (one drink equals 1 ounce of 100-proof or one 12-ounce bottle of beer).
2. Find the percentage of blood alcohol listed in the table under "number of drinks" and opposite "body weight."
3. To estimate the percentage of alcohol burned up, decrease the figure in the table by .015 for each hour after the start of drinking.

   Example: 180 lb. man consumes 8 drinks in 4 hours:

   .167 (from table) minus (0.015 × 4 hours) = 0.10%

- Second if we were to accept an even slightly higher limit, we would have to tolerate an enormously greater risk. The relative chances of crashing increase so fast at BACs above 0.10% that *any* increase in the legal limit would be intolerable. At a BAC of 0.11%, for instance, the chances of crashing are about 10 times normal, or nearly twice the risk faced at 0.10%.

These points support the claim that 0.10% BAC is a *conservative* indication of alcohol impairment. There is no doubt that *anyone* is under the influence to an unsafe degree at that level. There also is no doubt that many drivers will be under the influence at lower levels. We have no reason, ever, to feel that the 0.10% level (or even the 0.08%) is unfair or unreasonable. On the contrary, our States have adopted laws that give every possible benefit of doubt to the DWI violator.

In light of these facts, the House of Delegates of the American Medical Association in 1960 adopted the following recommendation of its Reference Committee on Public Health and Occupational Health:

"(1) Although there is no minimal figure which can be set at which there will be absolutely no effect from alcohol, the Committee recommends that persons with a concentration of alcohol of less than 0.05%. . . should not be prosecuted for driving while under the influence of alcoholic liquor.

"(2) All persons show a definite loss of that clearness of intellect and control of themselves which they would ordinarily possess when the concentrations are above 0.10%. . . and should, therefore, be considered as under the influence.

Increased Driving Risk in Relation to BAC

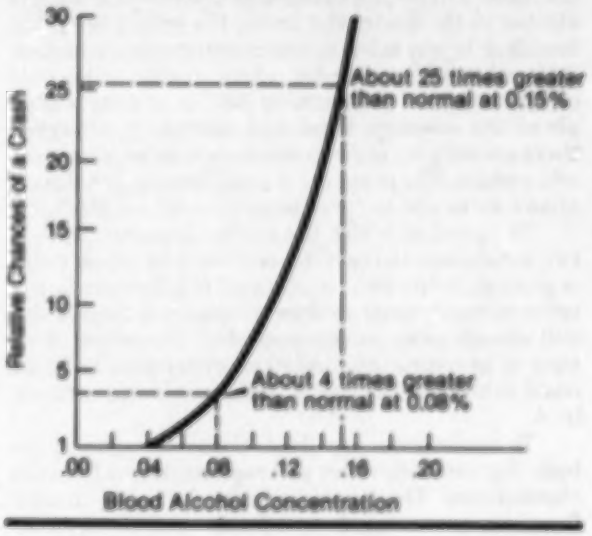


Exhibit 3-2.

"(3) When the alcohol concentrations are between 0.05% and 0.10%. . . a great many of the persons will be under the influence of alcohol, but the Committee recommends prosecution only when the circumstances and results of physical examinations give definite confirmation of such influence."

A key portion of this statement is the assertion that ". . . *a great many* of the persons will be under the influence. . ." at BACs between 0.05% and 0.10%. Again, this emphasizes that 0.10% is a conservative level. You should not hesitate to arrest a suspect when you know his or her BAC is 0.10% or more. You should also arrest the suspect if the BAC is below 0.10% if other evidence indicates he or she is under the influence.

General Principles of Chemical Tests of BAC

An important characteristic of alcohol is that it dissolves readily in water. Blood contains a high water content; it dissolves alcohol very well. Once in the blood, alcohol is carried throughout the body by the bloodstream. The blood deposits the alcohol in the body's organs and tissues in proportion to their water content. Organs and tissues that contain the most water receive the most alcohol. Within a relatively short time after a drink is consumed, alcohol reaches every water-containing cell in the body.

The concentrations of alcohol in the body's organs, tissue and fluids quickly establish an equilibrium or balance. That is, the concentration of alcohol in one body substance will balance with, or be proportional to, its concentration in any other substance. For example, the concentration of alcohol in the blood will be proportional to the concentration of alcohol in the brain, the urine, the spinal fluid, the breath or in any other substance that contains water. BAC means *blood* alcohol concentration. The only *direct* method of determining BAC is to draw a sample of the suspect's blood and analyze it. However, there are simpler *indirect* methods that provide accurate results. The principle of equilibrium, or balance, allows us to use *indirect* tests to measure BAC.

The point at which the alcohol concentrations of two substances balance depends on how much water is present in the two substances. If substance A has twice as much water as does substance B then A also will absorb twice as much alcohol. Therefore, if we were to measure the alcohol concentration in B, we could determine indirectly the alcohol concentration in A.

To summarize, any fluid, tissue or organ in the body that contains water will receive alcohol from the bloodstream. The concentration of alcohol in that fluid, tissue or organ will balance with the concentration of alcohol in the blood. The balance point depends on the ratio of the water content of the fluid, tissue or organ to the water content of the blood. If the fluid, tissue or organ contains twice the water content of the blood, the alcohol concentration of the fluid, tissue or organ will be twice the BAC. For example the ratio of the water content or urine to the water content of blood has been reported to be approximately 1 to 1.5*; that is, urine contains about 50% more water than does blood. Thus, the alcohol content of a urine sample would be about 1.5 times the alcohol content of a blood sample from the same person. For example, when the person's BAC is 0.10%, his or her urine alcohol concentration would be 0.15% (1.5 × 0.10% = 0.15%).

A chemical test of BAC, therefore, can be performed on any bodily substance that contains water. Common types of chemical test substances include the following:

- Urine.
- Saliva.
- Spinal fluid.
- Breath.
- Various tissues (brain, liver, lung, etc.).
- Blood (the only *direct* test substance).

The key point to remember is that indirect chemical tests of BAC can be just as accurate as direct blood tests, provided we know the equilibrium ratio of the water contents of blood and the indirect test substance.

Breath is the indirect chemical test substance that this course involves. Like any other indirect methods, the breath test is based on the principle of equilibrium; that is, the ratio of the alcohol concentrations of a breath sample and a blood sample (from the same person) is a constant value. So if we know the person's *breath* alcohol concentration, we can determine his or her *blood* alcohol concentration.

Breath tests have a number of advantages over blood tests making them especially valuable for law enforcement purposes. The major advantages include the following:

- *Breath tests can be administered by nonmedical personnel.* Drawing a blood sample usually requires the services of a physician, nurse or certified medical technician. This service can increase the time and cost of testing and bring in a third party whose testimony may be required in court. Breath samples, however, can be taken easily by a trained police officer.
- *Breath tests do not require laboratory services for analysis.* Breath testing instruments contain built-in analyzers. After the sample of breath is collected the analysis takes place immediately.
- *Breath tests provide an immediate result.* This feature obviously is essential for prearrest

*Researchers report some variation in this ratio.

screening and also is desirable for postarrest breath tests taken for evidentiary purposes. By providing a BAC measurement within one or two minutes after sample collection, the breath test allows you to identify people who are *not* under the influence of alcohol, but rather are victims of stroke, poisoning or other conditions requiring prompt medical attention. Blood test results, conversely, might not be available for several hours or even days.

- *Breath tests usually are more acceptable to suspects.* Many suspects balk at the syringe used to extract a blood sample. Few fear the breath testing process.

There are some disadvantages associated with breath tests. The principal disadvantage (compared to blood testing) is that a breath test requires the person be conscious and able and willing to cooperate. But the vast majority of DWI suspects will be conscious, and the implied consent law encourages their cooperation. You will find, therefore, that breath testing is well suited to nearly all DWI cases.

Principles of Breath Testing

Like all indirect chemical tests of BAC, breath testing is based on the principle of equilibrium. The equilibrium between blood and breath takes place in the deepest part of the lungs, near tissues called the *alveoli*. The alveoli exchanges gases between the breath and the blood. They extract oxygen (and tobacco smoke, inhaled fumes and other impurities) from the breath and pass it into the blood. They remove carbon dioxide and water vapor (and alcohol, nicotine, etc.) from the blood and pass it into the deep-lung breath where it can be exhaled from the body.

Deep-lung breath is called *alveolar breath*. It is the portion of the breath nearest to the alveoli. Alveolar breath establishes equilibrium with the blood, based on the water content of the alveoli and blood. The equilibrium ratio is *2100 to 1*. That is, a particular volume of blood contains 2100 times as much alcohol as does the same volume of alveolar breath; therefore, the *blood* alcohol concentration is 2100 times higher than the deep-lung *breath* alcohol concentration. It might seem that breath alcohol concentrations are very low and, therefore, are difficult to measure. Modern breath testing devices, however, can perform very accurate analyses using these low concentrations.

When you perform a breath test, make sure that you collect and analyze a sample of alveolar breath, since it is only deep-lung breath that maintains the 2100 to 1 equilibrium ratio with the blood. Breath from the upper part of the lungs and from the mouth is called *tidal breath*. Tidal breath is farther from the alveoli and receives less alcohol from the blood. As a person speaks and breathes shallowly, outside air constantly exchanges with tidal breath (flowing in and out, much like seawater with the tides). Therefore, tidal breath contains a lower alcohol concentration than does alveolar breath and tidal breath does not stay in equilibrium with the blood.

When a person exhales he or she expels a mixture of tidal breath and alveolar breath. The *first part* of the exhalation consists almost entirely of tidal breath; as the exhalation continues the person expels a higher proportion of alveolar breath. The average person must exhale for about 5 to 6 seconds before eliminating most of the tidal breath. The last part of his or her exhalation consists almost entirely of alveolar breath and provides a good sample for accurate measurement of BAC. Many breath testing instruments automatically get rid of the first 5 to 6 seconds of the breath sample and trap only the last portion of the exhalation to make sure the result is accurate.

If performed properly a breath test is as accurate as a blood test. Several factors can affect the accuracy of a breath test, however. These include the following:

- *The composition of the breath sample.* Breath composition means the mixture of tidal breath and alveolar breath. If the sample contains some tidal breath, it will have *less* alcohol than would a pure alveolar sample. Therefore, the test result will be *lower* than the suspect's true BAC.

  The only way to prevent this is to follow proper procedures carefully to eliminate most of the tidal breath from the sample.

  Remember that this factor always acts in the suspect's favor. If the sample is a mixture of tidal breath and alveolar breath, the test result will be lower than the actual BAC, never higher.

- *Residual mouth alcohol.* After a person takes a drink, some of the alcohol will remain in the mouth tissues. If the person exhales soon after drinking, his or her breath sample will pick up some of this left-over mouth alcohol. In this case, the breath sample will contain an additional amount of alcohol and the test result will be *higher* than the true BAC.

  It takes approximately 10 to 15 minutes for the residual alcohol to evaporate from the mouth. This cannot be speeded up significantly by having the suspect gargle with water or in any other way.

  The only sure way to prevent this factor is to make sure the suspect does not take a drink or put any alcohol in his or her mouth for at least 10 to 15 minutes before conducting a breath test. Remember, too, that most mouthwashes, breath sprays, cough syrups, etc., contain alcohol and will produce residual mouth alcohol. Therefore, it is always best not to permit the suspect to put *anything* in his or her mouth for at least 10 to 15 minutes prior to testing.

- *Breath Contaminants.* In theory at least, some types of breath tests *might* react to certain substances other than alcohol. For example, substances such as ether, chloroform, acetone, acetaldehyde and cigarette smoke *conceivably* could produce a positive reaction on certain breath testing instruments. If so, the test would be contaminated and its result would be higher than the true BAC.

  Contaminating substances such as those mentioned above rarely are present in breath samples; even if present, they usually appear in very low concentrations. Also, not all types of breath testing instruments will react to these contaminants. At most, these contaminants will affect only slightly a very few breath tests. As far as prearrest screening is concerned, the possibility of breath contaminants is a minor problem.

  Remember that characteristics of normal breath samples: halitosis, food odors, etc., do not affect the BAC measurement.

Breath Analysis Techniques

There are several ways to analyze a breath sample to determine its alcohol content. All of these methods are based on proven scientific principles. Various instruments use these different methods. All methods, if properly applied, provide accurate, reliable results. The more commonly used breath analysis techniques are described below.

- *Oxidation/Photometric.* This method makes use of the fact that alcohol chemically reacts very well with a solution of potassium dichromate in sulphuric acid. That chemical has a characteristic yellow color. When alcohol is added and the reaction takes place, the yellow color starts to fade. The color change occurs because the chemical oxidizes ("burns") the alcohol. The amount of color change depends on how much alcohol is present. There are two ways to measure the color change. First, it can be precisely measured using a photoelectric circuit. Second, it can be estimated by simple visual observation; of course, the visual observation can provide only an indication or rough approximation of BAC.

  Two general classes of breath testing instruments use this method. The first class consists of devices that have built-in photoelectric circuits that precisely measure BAC. Examples of these devices include the Alcotector, the Breathalyzer and the Photo-Electric Intoximeter.

  Instruments of the second class use visual estimation of the color change. These are screening devices, more commonly known as "balloon" or "bag" tests. Their alcohol-sensitive chemical is stored in a glass or plastic tube and the suspect's breath is passed through the tube. Alcohol in the breath causes some of the chemical to change color; it is possible to estimate, visually, how much of the chemical changed color (in comparison to the total length of the tube) and thus to estimate BAC. Examples of these devices include the Alcolyser and the Sober-Meter.

- *Gas Chromatography.* Gas chromatography is a process by which any gas or vapor is separated physically into its component substances. The process works just as well for breath as it does for any other gas mixture. When applied to a breath sample, gas chromatography separates out the carbon dioxide, water vapor, ethyl alcohol, acetone and other substances present. After separation, the amount of each substance can be measured independently.

  Breath testing devices using this method include the Alco-Analyzer Gas Chromatograph and the Gas Chromatograph Intoximeter.

- *Infrared Absorption.* This method uses the fact that alcohol absorbs energy from infrared radiation. If infrared light is passed through a breath sample that contains alcohol, some energy will be lost in the passage. The more alcohol present, the more energy will be lost. Thus, BAC is determined by measuring the energy loss.

  The Intoxilyzer is a breath testing instrument that uses this method.

- *Electrochemical Oxidation (Fuel Cell).* This method uses special electronic components that generate electrical energy by oxidizing ("burning") a fuel. The components are called electrochemical cells, or fuel cells.

  Ethyl alcohol is an excellent fuel and it can readily be oxidized by fuel cells to generate an electrical current. If a breath sample containing alcohol is passed over a fuel cell, a current is produced. The amount of electrical current generated depends on how much alcohol is present in the breath sample. BAC is determined by measuring the electrical output.

  The Alco-Limiter and the Alco-Sensor use this method.

- *Semiconductor.* This method also uses a special electronic component—in this case, a solid-state semiconductor. The semiconductor conducts a portion of an electrical current that is input to it. The amount of current it will conduct can be changed by introducing alcohol into the semiconductor.

If a breath sample containing alcohol is passed by the semiconductor, the alcohol will be absorbed by the semiconductor, which then will transmit a greater portion of the electrical current. The more alcohol absorbed, the more current will be conducted. BAC is determined by measuring the increase in conductance.

An example of a breath testing device that uses this method is the ALERT.

Each breath analysis technique has advantages and disadvantages. All can produce a very accurate measurement of BAC. For prearrest screening purposes, the methods most commonly used are oxidation/photometric, electrochemical oxidation and semiconductor. Instruments using these methods can be made relatively small and easily portable and require little or no power.

Study Topics

1. Learn why BAC is used as an indication of alcohol impairment. Specifically, be prepared to discuss why a BAC of 0.10% or more *definitely* indicates that a person is under the influence.
2. Study the basic principles of chemical tests of BAC, breath testing principles in particular.
3. Be prepared to answer the following questions:
   a. At a BAC of 0.12%, the average driver's chances of having a crash are much greater than normal. *How many times greater?* (Hint: Use Exhibit 3-2.)
   b. Any body fluid or tissue can be tested to measure BAC, *provided* that the fluid or tissue contains *what common substance?*
   c. The concentration of alcohol in the blood is *in balance* with the concentration of alcohol in any other body fluid or tissue. What is the technical term for this balance?
   d. What is the technical term for deep-lung breath?
   e. A particular volume of blood contains more alcohol than does the same volume of deep-lung breath? *How many times more?*
   f. For law enforcement purposes, what advantages does breath testing have over blood testing?
   g. Describe three different factors that could affect the accuracy of a breath test of BAC.
   h. Describe three breath analysis techniques commonly used in prearrest screening.
   i. Suppose a man weighing 190 pounds drank a six-pack of beer over a 3-hour period. Assuming he did this drinking on an empty stomach, approximately what would his BAC be at the end of those 3 hours? (Hint: Use Exhibit 3-1.)

Unit 4
PBT Equipment

In this and the following unit you will learn about specific PBT devices, how they are operated, and what they will do for your DWI arrest performance. After you complete this unit, you should be able to:

- Identify and describe the major types of PBT instruments.
- Describe the effectiveness of PBTs for drinking-driving enforcement.

Unit Content

Types of PBT Instruments

In the previous unit, we discussed the most commonly used methods of breath sample analysis. Three of those methods are most often applied to prearrest screening—oxidation/photometric, electrochemical oxidation, and semiconductor. These three methods are associated, virtually exclusively, with two major types of PBTs:

- *Disposable* PBTs, which use the oxidation/photometric method.
- *Reusable* PBTs, which usually use either electrochemical oxidation or a semiconductor.

The disposable type of PBT is the older of the two. This type of instrument has two major components:

- A plastic or glass *tube* containing a measured amount of a chemical that reacts to alcohol. Typically, the chemical is a chromate salt and a mineral acid. The chemical is yellow in color.
- A *balloon* or inflatable plastic bag used to collect a measured amount of the suspect's breath.

Because of this second component, disposable PBTs often are called "balloon tests."

The chemical in the tube reacts to alcohol by changing color, usually from yellow to green. The suspect's breath sample is introduced at one end of the tube. If there is alcohol in the sample, the chemical near that end of the tube begins to change color. The color change advances up the tube until all of the alcohol is depleted. After that, no more of the chemical will change color. The amount (i.e., length) of chemical that changed color indicates the BAC.

When using a disposable PBT, you must introduce *precisely* the right amount of breath into the tube. The amount of chemical in the tube has been measured carefully so that it needs a particular amount of alcohol to cause a color change indicating a BAC of, for example, 0.10%. If the suspect were permitted to keep blowing into the tube, eventually he or she would introduce enough alcohol to change the color of the entire tube. If the suspect were permitted to stop blowing too soon, the color change would also stop before reaching the true BAC.

The reusable type of PBT is a more recent development. Reusable instruments use electronic sensor mechanisms that are similar to those used by some evidentiary-quality breath testing instruments. Indeed, some reusable PBTs, with little or no modification, could serve to obtain postarrest BAC measurements for introduction as evidence.

The reusable instruments automatically transform electronic measurements into BAC measurements and display these on a meter or digital display or by lighting indicator lamps, etc. Thus, the instrument operator can read BAC directly.

A reusable PBT, just like a disposable instrument, requires that a precise amount of breath be collected. However, most reusable PBTs do this automatically. Also, many reusable PBTs automatically eliminate tidal breath from the collected sample.

The most important difference between disposable and reusable PBTs is their relative accuracy. Disposable instruments provide approximate measurement of BAC. In addition, they are susceptible to operator error, which further reduces their accuracy. Many reusable PBTs, on the other hand, are almost as accurate as evidential breath testing instruments. Reusable PBTs represent a substantial advance in prearrest screening technology over disposable devices. Further, the cost of reusable devices compares favorably with that of disposable PBTs. If purchased in large quantities, the cost per test of a "balloon" device will be roughtly $1. The purchase price of a reusable PBT typically will be several hundred dollars, but with reasonable care and routine maintenance it can provide thousands of tests; hence, its cost per test may be only a few cents.

PBT Effectiveness

In Unit 1 we stated that the overall objective of this course is to improve the effectiveness of drinking-driving enforcement through the proper and efficient use of PBTs. To do this, we believe improvement is needed in two areas:

- *We must increase the number of DWI arrests.*
- *We must improve detection and apprehension of DWI violators with BACs between 0.10% and 0.15%.*

Why do we make these claims? Let us first consider the need to make more arrests. Our *ideal enforcement* goal would be to apprehend and arrest every DWI violator *every time* he or she commits that offense. Obviously, we cannot hope to do that. We do not have nearly enough patrol resources to detect all or even most DWI violations; we can't be in all places at all times. Instead, we can realistically hope to detect and stop *enough* DWI violators to have a meaningful effect on the alcohol/crash problem. That is, we hope to arrest enough violators so that:

- An appreciable number of drinking-driving incidents are stopped before they result in crashes.
- An appreciable number of violators can be found and given proper treatment for their drinking-driving problem.
- An appreciable number of potential violators become aware that they might be arrested if they commit DWI.

To do these things, we must provide enough enforcement so that there is a *reasonable chance* that any particular DWI violator will be arrested at any particular time he or she commits the offense.

Research indicates that at present the chances of arresting any given DWI driver are very slim. The odds are only about 1 in 300 that a police officer will even stop and investigate any given violator at any given time the violator is under the influence. It is even more startling to note that research shows *only about 1 in 4 of violators who are stopped are actually arrested for DWI*. Taken together, this means that the odds are about 1,200 to 1 *against* being arrested on any given DWI trip. This chance of arrest would hardly deter an appreciable number of violators or prevent an appreciable number of alcohol-related crashes; consider that with 1,200 to 1 odds the average DWI violator could drive about 38,000 miles and commit the DWI offense on about 300 different occasions before he or she is arrested.

These figures show that arrests for DWI must increase before violators will face a reasonable chance of apprehension. Much of the necessary improvement could come during the investigation of suspected DWIs; that is, *after* suspects have been stopped. As noted above, only one in four *stopped* violators actually is arrested; the other three escape the DWI charge. If we could reverse these figures so that three out of each four violators stopped were arrested, we would triple the number of DWI arrests *without stopping any more suspects than we do at present*. But why do so many stopped violators escape arrest? For the most part, it is because it is difficult to obtain sufficient probable cause to believe suspects are under the influence.

This brings us to the second claim we made earlier—we need to improve detection and apprehension of DWI violators. One reason it is difficult to obtain probable cause is that many persons with BACs above 0.10% do not show obvious signs of intoxication or large-scale impairment. This is especially true of violators with BACs between 0.10% and 0.15%. These people are definitely under the influence of alcohol and should be arrested. However, they may be able to hide their impairment fairly well from the investigating officer and escape arrest. Exhibit 4-1 depicts this situation. Research shows that the great majority of DWI violators on the road at any given time have BACs between 0.10% and 0.15%. However, relatively few of the violators who are arrested have BACs below 0.15%. The implication clearly is that although the violator with a BAC between 0.10% and 0.15% might be stopped for investigation, he or she often escapes arrest because it is difficult to establish probable cause to believe he or she is under the influence. These drivers account for many of the three out of four investigated violators who are released.

Our greatest opportunity, therefore, centers on the violator with a BAC level between 0.10% and 0.15%, *if only we can succeed in establishing probable cause for arrest*. This is where prearrest screening comes into play. It allows you to conduct a scientific test of a suspect who you feel might be under the influence, but who does not appear to be so clearly intoxicated that you can arrest him or her without hesitation. If the suspect "fails" the test, you will have reason to believe that his or her BAC is 0.10% or higher. That fact, together with the observations you have made, can provide the probable cause that otherwise might be absent.

The points we have raised on the preceding pages have been largely theoretical. We have said that prearrest screening *in theory* will support other evidence developed in our investigation of DWI violations; we also have said, *in theory*, that this should lead to more DWI arrests. At the same time, a greater portion of violators with BACs between 0.10% and 0.15% would be arrested. But how well does this work *in practice*? Do PBT instruments actually lead to more arrests, and to a lower average BAC? Do these instruments work well enough in the field so that you can trust their results?

The answer to these questions is "Yes," provided the PBTs are used properly and provided they are cared for reasonably well. PBTs won't help if you use them only to test suspects you have already decided to arrest. They won't work well for very long if you toss them carelessly in the trunk, allow their batteries to

run down, or otherwise abuse them. But if you use them carefully, and selectively, you will see a substantial improvement in your DWI enforcement. We base this claim on the experience of police officers from many law enforcement agencies, including the following:

- *Nebraska* (selected State patrol districts, county sheriffs' offices, and municipal departments). Officers reported a 70% increase in DWI arrests during a 1-year period when selected officers used a variety of reusable PBTs (electrochemical oxidation and semiconductor models). They reported a decrease in the average BAC of arrest from 0.199% to 0.187% during the same period, indicating that more borderline violators were apprehended.
- *Hennepin County, Minnesota* (State patrol district, county sheriff's office, and selected municipal departments). During a 4-month field test in which selected officers used an early model of a semiconductor PBT, officers reported a 62% increase in arrests. The average BAC of arrestees who were tested on the PBT was 0.14%; the average of those not tested was 0.179%.
- *Alabama* (selected highway patrol districts). Officers using either a semiconductor or electrochemical oxidation PBT reported a 19% increase in arrests and a decrease in average BAC of arrest from 0.159% to 0.14% during a 1-year field test.
- *New York* (selected State police districts). During a 6-month field test of an electrochemical oxidation PBT, a 46% increase in DWI arrests was reported. One district reported a drop in the average BAC of arrest from 0.19% to 0.14%.
- *South Dakota* (selected municipal departments). Officers using a semiconductor PBT during a 6-month trial period increased their DWI arrests by 70%; the proportion of arrestees with borderline BACs (0.10% to 0.14%) increased by about 250%.

These examples show that many officers have had good success with various PBT instruments and that enforcement has improved where these instruments have been used. It is also evident that reusable PBTs work well when treated properly. In a 1-year field test involving more than 50 police agencies from six States, during which more than 3,600 PBT tests were conducted of possible DWI violators, the following facts emerged:

- Sixty-four percent of the suspects tested on the PBT were arrested for DWI.
- PBT arrestees had an average BAC of 0.172%; the average for suspects who were arrested without being tested on the PBT was 0.201%.
- Only 4% of the suspects who failed the PBT later were found to have BACs below 0.10%.
- None of the suspects who failed had a BAC below 0.05%.
- Only 11% of suspects who were asked to take the prearrest screening test refused to do so.
- Seventy-five pecent of the officers who participated reported that their PBTs almost always worked properly. Only 15% reported any malfunctions during the year (and many of those malfunctions occurred because the instrument received improper care).
- More than half of the participating officers felt that their PBTs improved their ability to identify DWI violators. Seventy-five percent of the officers rated the PBT as "a good idea" for DWI enforcement.

These facts show that PBT instruments are quite accurate and reliable, that they make a definite contribution to DWI enforcement, and that officers who have used PBTs recognize their value. Manufacturers of PBTs have made substantial improvements in their instruments during the several years since this six-State field test was conducted. The reusable PBTs now on the market are even more accurate and rugged.

Although you should use your PBT whenever it can assist your investigation, you must always remember that the PBT is only a tool—the instrument is not the enforcer, *you are*. The improvements we need in DWI enforcement can only be achieved *if you* make the maximum possible effort to detect drinking drivers, investigate them as carefully and thoroughly as possible, and arrest them whenever the evidence warrants. Your PBT will *aid* your judgment. It can *not* replace your judgment.

Study Topics

1. Learn the characteristics of disposable and reusable PBTs.
2. Familiarize yourself with the need to increase DWI arrests and reduce the average BAC among arrestees.
3. Review the improvements in DWI enforcement that various PBT users have experienced.
4. Be prepared to answer the following questions:
   a. If a suspect is tested on a disposable PBT ("balloon test") and inflates the balloon more than the proper amount, the test result will be *higher* than the suspect's true BAC. Why is this?
   b. What is the most important advantage that reusable PBTs have over disposable PBTs?
   c. Explain how PBTs will help to reduce the average BAC among DWI arrestees.
   d. Drivers with BACs between 0.10% and 0.15% account for about three-quarters of all DWI *violations*, but they account for only about one-third of all DWI *arrests*. Why is this?

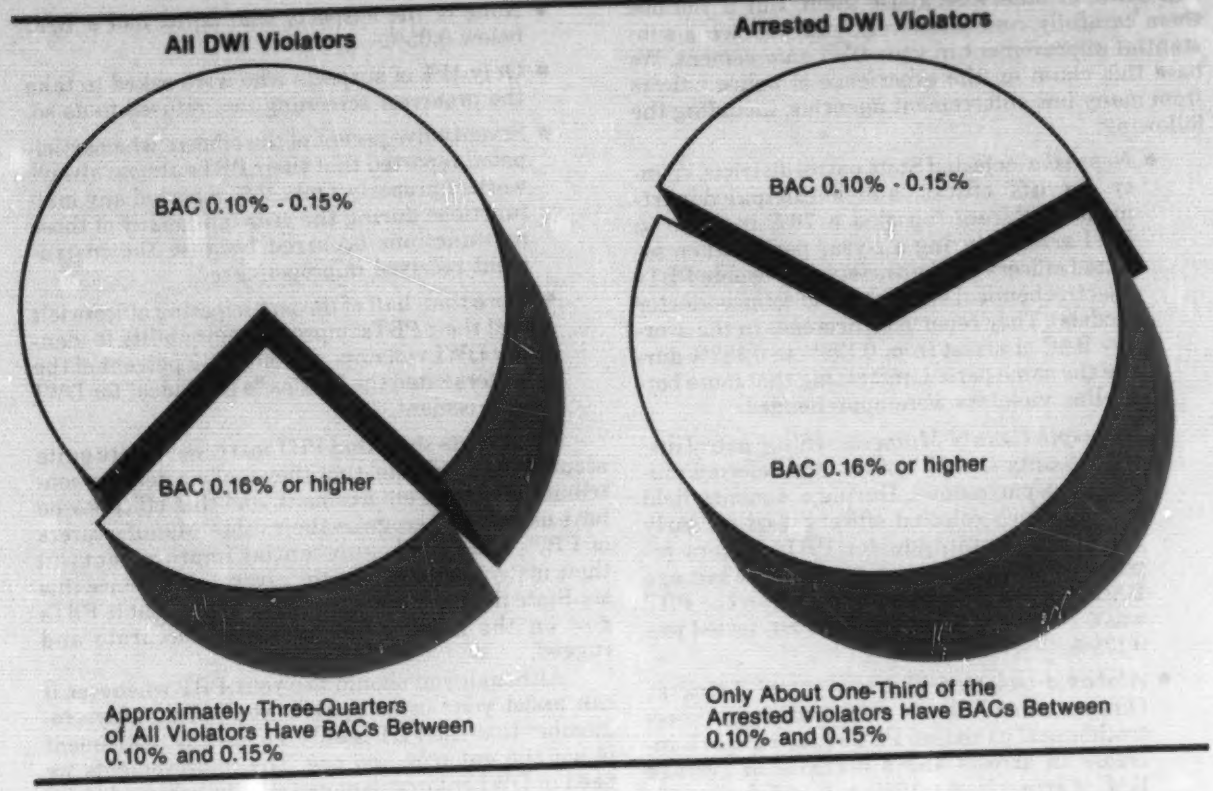

All DWI Violators
BAC 0.10% - 0.15%
BAC 0.16% or higher
Approximately Three-Quarters of All Violators Have BACs Between 0.10% and 0.15%
Arrested DWI Violators
BAC 0.10% - 0.15%
BAC 0.16% or higher
Only About One-Third of the Arrested Violators Have BACs Between 0.10% and 0.15%

Exhibit 4–1.

Unit 5
PBT Operation

Objectives

To provide you with sufficient information to:

- Identify the PBT instrument(s) you will use for prearrest screening.
- Identify and describe the PBTs' major components and their functions.
- Describe the instrument's operating procedures (and its inspection and calibration procedures, if applicable).

To provide you with sufficient hands-on practice to acquire skill in operating a PBT.

Unit 5.1 Content

Instrument Name and General Description

The ALERT, Model J3A, is a reusable device manufactured and distributed by Alcohol Countermeasures Systems, Inc. The instrument weighs approximately 2-1/2 pounds. Its operation is largely automatic.

The ALERT uses a solid-state semiconductor to measure the alcohol content of a breath sample.

- Alcohol present in the breath sample increases the electrical conductance of the solid-state semiconductor.
- The higher the BAC, the greater will be the voltage output of the semiconductor.

Display lights indicate test results.

- The FAIL lamp indicates that BAC is at or above the level selected as indicating "under the influence."
- The PASS lamp indicates that BAC is less than one-half the fail level.
- The WARN lamp indicates that BAC is at least one-half the fail level, but not at that level.

The fail level can be set at any BAC. The process of setting the fail level is called *calibration*.

Instrument Components and Their Functions

Major components located *inside* the ALERT include the following:

- *The solid-state semiconductor,* which detects and measures alcohol in the breath sample.
- *The breath pressure switch,* which detects flow of breath and ensures that the suspect is blowing sufficiently hard and steadily to expel tidal breath.
- *The timer,* which is activated by the breath pressure switch. The timer allows breath to flow for 6 seconds before the sample is trapped and tested. It ensures elimination of tidal breath.
- *The heater unit,* which brings temperature of the semiconductor up to 350° C; it prepares the detector for analysis and prevents alcohol from condensing out of the breath sample.
- *The batteries* (3 "C"-size nickel cadmium), which supply power to the instrument; they are rechargeable.

Major components located *on the surface* of the ALERT include the following:

- *The START switch,* which turns the instrument on and automatically activates the heater.
- *The ON lamp,* which lights when the start switch is placed in the "on" position. *Note:* If the ON lamp does not light or if it flashes, the batteries need replacement.
- *The READY lamp,* which lights when the semiconductor has been heated to the proper temperature; signifies that ALERT is ready for a test.
- *The TEST lamp,* which lights when the suspect begins to blow into the instrument. It is activated by the breath pressure switch and indicates that a valid breath sample is being supplied.
- *The breath intake port,* which is the opening into which the mouthpiece is placed. The sus-

ALERT, Model J3A

pect blows through the mouthpiece into the intake port.

- *The test result lamps,* which are PASS, WARN, and FAIL; one of these lights at the end of a valid test.
- *The charging connector,* which is the receptacle into which the battery charger is plugged.
- *The calibration adjustment screw,* which is used to set minimum BAC level that will cause the FAIL lamp to come on; automatically sets minimum BAC level for the WARN lamp as well.
- *The RESET switch,* which is used in conjunction with the calibration adjustment screw to establish minimum BAC for FAIL. It also is used to test the lamps: when the RESET switch is held in *all* lamps should light; any that fail to light must be replaced.

Basic Operating Procedures

Step 1: Install a fresh mouthpiece.

- Insert the mouthpiece adaptor into the breath intake port.
- Attach the mouthpiece to the adaptor.

Step 2: Turn the START switch to the "on" position.

- Observe that the ON lamp lights steadily.
- Wait until the READY lamp lights.

Note: If the ON lamp does not light or if it flashes, you must replace the batteries and you cannot administer the test. If the READY lamp does not light, do not give the test.

Step 3: Tell the suspect that he or she must blow moderately hard and steadily, with his

or her mouth on the mouthpiece. Hold the instrument toward the suspect, face up.

Step 4: Tell the suspect to start blowing and to continue to blow until you say to stop.

- Observe that the TEST and READY lamps are lit continuously as the suspect blows into the mouthpiece.
- Make sure that the suspect keeps blowing until both the TEST and READY lamps extinguish (approximately 6 seconds).

Note: If the TEST lamp goes out, it means that the suspect stopped blowing too soon. *The test must be repeated.* Discard the mouthpiece and install a new one. Return to step 2.

Step 5: After the TEST and READY lamps extinguish, *tell the suspect to stop blowing.*

- Remove and discard the mouthpiece.
- Observe the test result lamps and note which one lights.

Step 6: Record the test result and turn the START switch to the "off" position.

Inspection and Calibration

Your main inspection tasks are to check the batteries and the display lamps.

- Check battery status with the ON lamp.
- Check the display lamps with the RESET switch.

Batteries should be charged *constantly* when the instrument is not in use. There is no danger of overcharging.

Battery charging procedures are as follows:

- Plug the charger unit into a source of 115 volts a.c. power (50 to 60 cycle).
- Plug the charger unit into the charging connector port on the ALERT's surface.
- Wait 10 to 12 hours to obtain a full charge. (If the instrument was exposed to below-freezing temperatures for many hours, a longer charging period may be needed.)

Replace batteries if the ON lamp does not light or if it flashes, or if the instrument provides fewer than 10 tests after being fully charged.

Battery replacement procedures are as follows:

- Mark the new battery pack with the replacement date.
- Remove four screws from the battery pack panel.
- Remove the old battery pack and disconnect it from the instrument.
- Connect the new battery pack and replace it in the instrument.
- Replace the panel and the screws.
- Mark or discard the old battery pack.
- Turn the START switch to "on" and make sure that the ON lamp lights to verify that the new batteries are properly installed.

Calibration is the process of establishing the minimum BAC that will cause the FAIL light to come on.

You will need a *breath alcohol simulator* to calibrate your PBT. The simulator is an instrument that provides an alcohol-air mixture that is identical to the breath of a person having a particular BAC. For calibration purposes, the simulator solution (a mixture of alcohol and distilled water) must be prepared to provide the BAC that will be established as the fail threshold.

Calibration procedures are as follows:

- Prepare the simulator.
- Turn the START switch to the "on" position.
  - — Wait for the READY lamp to light.
- Connect the simulator outlet to the breath intake port.
- Blow through the simulator into the ALERT.
  - — Make sure the TEST lamp lights steadily.
  - — Keep blowing until TEST and READY lamps extinguish (approximately 6 seconds).
- Disconnect the simulator from the ALERT.
- Observe the test result lamps and note which one comes on.
- Adjust the calibration adjustment screw as follows:

  Case 1—If the FAIL lamp came on after the simulator test,

  - — Turn the adjustment screw several turns *counterclockwise.*
  - — Push and release the RESET switch; if the FAIL lamp remains on, turn adjustment screw several more turns *counterclockwise* and again push and release the RESET switch.
  - — Continue this process until the WARN lamp comes on after the RESET switch is pushed and released.
  - — When the WARN lamp comes on, *slowly* turn the adjustment screw *clockwise.*
  - — Stop turning immediately when the FAIL lamp comes back on. Instrument is now calibrated.

Case 2—If the WARN or PASS lamp came on after the simulator test,

— *Slowly* turn the adjustment screw *clockwise*.

— Stop turning immediately when the FAIL lamp comes on. Instrument is now calibrated.

Study Topics

1. Familiarize yourself thoroughly with the contents of this unit, and especially with ALERT operating procedures.
2. Be prepared to answer the following questions:
   a. How does the ALERT ensure that it eliminates most of the tidal breath from the sample?
   b. An unlit ON lamp indicates that the batteries need replacement; how do we know that the ON lamp itself is not simply burned out?
   c. What happens when a suspect stops blowing into the instrument before the 6-second timer runs out?
   d. What must happen before the READY lamp will light?
   e. What are the basic operating procedures for the ALERT?

The Alco-Sensor

Unit 5.2 Content

Instrument Name and General Description

The Alco-Sensor is a reusable device distributed by Intoximeters, Inc. It weighs 5 ounces and is about the size of a pack of cigarettes.

The Alco-Sensor uses a *fuel cell* to measure the alcohol content of a breath sample.

- The fuel cell absorbs the alcohol from the breath sample, oxidizes it and produces an electrical current.
- The higher the BAC, the greater will be the current output of the fuel cell.

Display lights indicate test results.

- The ZERO lamp indicates that BAC is less than 0.01%.
- The FAIL lamp indicates that BAC is at or above the level selected as indicating "under the influence."
- The WARN lamp indicates that BAC is at least 80% of the fail level, but not at that level.
- The PASS lamp indicates that BAC is at least 0.01%, but less than 80% of the fail level.

The fail level can be set at any BAC. The process of setting the fail level is called *calibration*.

Instrument Components and Their Functions

Major components located *inside* the Alco-Sensor include the following:

- *The fuel cell* which detects and measures alcohol in the breath sample.
- *The battery* (22½ V) which supplies power to the instrument. The battery should last for at least 1,000 tests.
- *The breath sampling valve* which draws 1 cubic-centimeter (cm^3) of breath into the fuel cell.

Major components located *on the surface* of the Alco-Sensor include the following:

- *The temperature display* (in degrees centigrade). The most efficient operating range is 26° to 36° C (79° to 97° F).
- *The SET pushbutton* which cocks the breath sample; it also electrically "shorts" the fuel cell to hasten elimination of any residual alcohol from the previous test.
- *The READ pushbutton* which releases the breath sampling valve, thus drawing 1 cm^3 of breath into the fuel cell; it also turns the instrument "on" electrically.
- *The breath intake port* which is the opening into which the mouthpiece is installed. The suspect blows through the mouthpiece past the breath intake port; when the breath sampling valve is released, breath is drawn through the intake port.
- *The test result lamps* which are ZERO, PASS, WARN and FAIL. One of these lights at the end of a test.
- *The battery status indicator lamp* which should light whenever the READ pushbutton is depressed. If it does not light, replace the battery.
- *The calibration adjustment screw* which is used to set the minimum BAC level that will cause the FAIL lamp to come on. It also automatically sets the minimum level for the WARN lamp.
- *The zero adjustment screw* which is used to adjust the ZERO lamp to ensure that only a clean (alcohol-free) air sample will cause the lamp to light.

Basic Operating Procedures

Step 1: Depress the SET pushbutton and place the Alco-Sensor in your pocket for 5 to 10 minutes. (Placing the instrument in your pocket will warm it up to the proper operating temperature.)

- Observe the temperature display to make sure that the proper operating temperature has been reached.

Step 2: Depress and hold down the READ pushbutton for 10 seconds.

- Make sure that the SET pushbutton is released when READ is depressed.
- Make sure that the battery status indicator lights when READ is depressed. If it does *not* light, replace the battery before giving the test.
- Make sure that the ZERO lamp comes on and remains lighted while READ is held down.

Note: If ZERO does not remain lit for 10 seconds while READ is held down, residual alcohol from previous test may still be present. Depress the SET pushbutton again and put the instrument back in your pocket for several minutes. If ZERO still does not remain lighted with READ depressed, adjust to ZERO before giving the test.

Step 3: After you have made a valid ZERO check, depress the SET pushbutton and

install a fresh mouthpiece on the breath intake port.

Step 4: Tell the suspect that he or she must blow hard and steadily with lips on the mouthpiece. Hold the instrument toward the suspect vertically.

Step 5: Tell the suspect to start blowing and to continue to blow until you say to stop.

- Watch the suspect and listen for sound of air rushing through the mouthpiece to make sure he or she is providing a valid breath sample.
- Keep your thumb poised above the READ pushbutton in preparation for taking the sample.
- Watch for signs that the suspect is about to run out of breath.

Step 6: Just before the suspect runs out of breath, depress the READ pushbutton momentarily and tell the suspect to stop blowing.

- Remove and discard the mouthpiece.
- Wait 5 seconds to allow the fuel cell to absorb alcohol from the breath sample.

Step 7: Depress and hold down the READ pushbutton for 60 seconds.

- Observe the test result lamps.
- More than one lamp might light during the 60 seconds; the test result is the "highest" lamp that lights.

Step 8: Record the test result and depress the SET pushbutton to clear the fuel cell.

Inspection, Adjustment and Calibration

The main inspection tasks are to check the battery, the temperature display and the SET and READ pushbuttons.

Battery status is checked by depressing the READ pushbutton and observing the battery status indicator lamp; the lamp should remain lighted with READ held down.

Battery replacement procedures are as follows:

- Mark the new battery with the replacement date.
- Slide the battery panel door open.
- Remove the old battery.
- Observe the polarity markings on the panel door.
- Insert a new battery with the proper polarity.
- Close the battery panel door.
- Mark or discard the old battery.
- Depress the READ pushbutton and observe the battery status indicator to verify that the new battery is properly installed.

You can check the temperature display by placing the Alco-Sensor in a controlled temperature environment for approximately 20 minutes. At the end of that period, the display should show the temperature of the controlled environment.

Check the operation of the SET and READ pushbuttons as follows:

- SET should hold in the down position when it is depressed.
- SET should release when READ is depressed.

Check the Alco-Sensor's ZERO settings as follows:

- Depress the SET pushbutton.
- Maintain the instrument at the proper operating temperature for at least 10 minutes.
- Depress and hold down the READ pushbutton for 10 seconds.
- Observe the ZERO lamp while READ is held down.
  - — If the lamp stays on for the full 10 seconds, ZERO is set properly.
  - — If the lamp does not stay on for the full 10 seconds, you will have to adjust for ZERO.

Adjust the Alco-Sensor's ZERO setting as follows:

- Depress and hold down the READ pushbutton continuously during the adjustment process.
- Wait 10 seconds after first depressing READ.
- Turn the ZERO adjustment screw *counterclockwise* until the PASS light just comes on.
- Turn the screw an additional *one-quarter turn clockwise*.

After completing the above steps, recheck the ZERO setting:

- Depress the SET pushbutton and wait 20 seconds.
- Depress and hold down the READ pushbutton for 10 seconds and verify that the ZERO lamp stays on.

Calibration is the process of establishing the minimum BAC that will cause the FAIL light to come on.

Calibration requires use of a breath alcohol simulator. The simulator is an instrument that contains an alcohol-gas mixture that approximates the breath of a person having a particular BAC. You must set the simulator for the BAC selected as the fail threshold.

Calibration procedures are as follows:

Step 1: Make sure the Alco-Sensor has not been used for 2 hours (or was used for fewer than 5 tests during the past hour).

Step 2: Depress the SET pushbutton and keep the instrument at proper operating temperature for at least 15 minutes.

Step 3: Depress and hold down the READ pushbutton for 10 seconds to check zero. Then depress the SET pushbutton again.

Step 4: Connect the simulator to the breath intake port.

Step 5: Deliver simulator gas into the breath intake port; allow the flow to continue for several seconds.

Step 6: While the simulator gas is flowing, momentarily depress the READ pushbutton; then stop simulator flow and disconnect the simulator from the Alco-Sensor.

Step 7: Wait 5 seconds, then depress and hold down the READ pushbutton for 60 seconds; observe the test result lamps.

Note: You cannot make the final calibration adjustment until the FAIL lamp comes on after the simulator test. Adjust the calibration adjustment screw as follows:

Case 1—The FAIL lamp does not light during the 60 seconds.

— If only the PASS light came on, turn the calibration adjustment screw at least *one full turn counterclockwise.*

— If the WARN lamp came on, turn the calibration adjustment screw at least *one-half turn counterclockwise.*

— Repeat the preparation steps listed above; continue this process until the FAIL lamp comes on after the simulator test.

Case 2—The FAIL lamp comes on after the simulator test.

— When the FAIL lamp comes on, *immediately* turn the calibration adjustment screw *clockwise* just enough to turn FAIL off and WARN on.

— The FAIL lamp should come back on within a few seconds; when it does, again *immediately* turn screw *clockwise* just enough to turn FAIL off and WARN back on.

— The FAIL lamp might come back on again; each time it does, immediately turn the screw *clockwise* to turn off FAIL and turn on WARN. Continue this process until FAIL stops coming back on.

Note: If the FAIL light does not come back on at least once after the initial screw adjustment, your instrument is *not* calibrated. You must repeat the preparation steps.

Study Topics

1. Familiarize yourself thoroughly with the contents of this unit, and especially with Alco-Sensor operating procedures.

2. Be prepared to answer the following questions:

   a. How do you make sure that you obtain a good deep-lung breath sample from the suspect?

   b. What is the function of the SET pushbutton?

   c. Suppose the WARN light comes on 15 seconds after the READ pushbutton is depressed following a test. Is it necessary to continue to hold the pushbutton down for the full 60 seconds? Why or why not?

   d. Suppose the FAIL lamp comes on 15 seconds after the READ pushbutton is depressed. Is it still necessary to hold the pushbutton down for the full 60 seconds? Why or why not?

   e. Suppose the suspect stops blowing before you depress the READ pushbutton. What should you do?

   f. What are the basic operating procedures for the Alco-Sensor?

The Alcolyser

Unit 5.3 Content

Instrument Name and General Description

The Alcolyser is a disposable device distributed by Intoximeters, Inc. It has two main components: a glass tube containing an alcohol-sensitive chemical and an inflatable plastic bag. The glass tube is thrown away after a single test. The plastic bag can be used for 10 tests.

The Alcolyser's chemical reacts to alcohol by changing color.

- The normal color of the chemical is yellow-orange.
- In the presence of alcohol, the chemical turns green.
- The amount of the chemical that changes color indicates BAC.

The glass tube has calibrations marked by the manufacturer.

- The tube has a red line at the midpoint of the chemical column.
- If the color change extends up to or beyond the red line, the suspect's BAC is at or above the level indicating "under the influence."

Basic Operating Procedures

Step 1: Using the glass cutter that comes with the test kit, remove the tapered ends of the glass tube.

- The tube is sealed to prevent contamination of the chemical.

Step 2: Locate the red arrow on the tube.

- The arrow shows the direction in which the breath must flow.

Step 3: Insert the arrow-point end of the tube into the entry port of the plastic bag.

- Make sure the tube just extends into the bag compartment and that the seal is airtight.

Step 4: Install a fresh mouthpiece onto the other end of the tube.

- Mouthpieces are supplied with the Alcolyser test kit.

Step 5: Tell the suspect that he or she must blow continuously through the tube until the bag is fully inflated.

- Make sure the bag is completely unfolded so that it will inflate easily.

Step 6: Tell the suspect to hold the tube, take a deep breath, start blowing and to continue to blow until you say to stop.

- Lightly hold the bag while the suspect blows into the tube.
- Observe the bag expansion.
- If the suspect stops blowing before the bag is fully inflated, tell him or her to take another deep breath and blow again.

Step 7: When the bag is fully inflated, tell the suspect to stop blowing and remove the tube from the bag.

Step 8: Expel the air from the bag and refold and return the bag to the test kit for future use.

Step 9: Observe the chemical column in the tube and note how much color change has taken place.

- It may take 30 to 60 seconds for the chemical to complete its reaction with the alcohol.

Step 10: Record the test result and throw away the tube and mouthpiece.

Study Topics

1. Familiarize yourself thoroughly with the contents of this unit.
2. Be prepared to answer the following questions:
   a. Suppose the suspect cannot completely fill the bag on a single breath and has to take a second breath to finish the test. How will this affect the test result? Why?
   b. Suppose for some reason the bag is not fully inflated. How will this affect the test result? Why?
   c. The plastic bag is to be saved and reused. Suppose some slight alcohol fumes remain in the bag from the previous test. Will this have any effect on the next test? Why or why not?
   d. What are the basic operating procedures for the Alcolyser?

Unit 5.4 Content

Instrument Name and General Description

The Alco-Sensor II is a reusable device distributed by Intoximeters, Inc. It weighs 5 ounces and is about the size of a pack of cigarettes.

The Alco-Sensor II uses a *fuel cell* to measure the alcohol content of a breath sample.

- The fuel cell absorbs the alcohol from the breath sample, oxidizes it, and produces an electrical current.
- The higher the BAC, the greater will be the current output of the fuel cell.

Test results are shown on a *digital display*. The display provides two digits and a decimal point.

Instrument Components and Their Functions

Major components located *inside* the Alco-Sensor II include the following:

- *The fuel cell*, which detects and measures alcohol in the breath sample. The instrument should provide up to 3,000 tests before the fuel cell needs replacement.
- *The battery* (9 V), which supplies power to the instrument. The battery should last for at least 1,000 tests.
- *The breath sampling valve*, which draws 1 cm^3 of breath into the fuel cell.

Major components located *on the surface* of the Alco-Sensor II include the following:

- *The temperature display* (in degrees Centigrade). The most efficient operating range is 26° to 36° C (approximately 79° to 97° F).
- *The SET pushbutton*, which cocks the breath sampling valve to *prepare for* drawing a breath sample. It also electrically "shorts" the fuel cell to hasten elimination of any residual alcohol from the previous test.
- *The READ pushbutton*, which releases the breath sampling valve, thus drawing 1 cm^3 of breath into the fuel cell. It also turns the instrument "on" electrically.
- *The breath intake port*, which is the opening into which the mouthpiece is installed. The suspect blows through the mouthpiece past the breath intake port; when the breath sampling valve is released, breath is drawn through the intake port.
- *The digital display*, which gives the test result (two-digit BAC value). It also indicates battery status: If the digital display shows "888" when the READ pushbutton is depressed, the battery needs replacement.
- *The calibration adjustment screw*, which is used to set the BAC value corresponding to the cell's electrical output; it ensures an accurate test result.
- *The zero adjustment screw*, which is used to ensure that a clean (alcohol-free) air sample will produce a test result of .00% BAC.

Basic Operating Procedures

Step 1: Depress the SET pushbutton and place the Alco-Sensor II in your pocket for 5 to 10 minutes; this warms it up to the proper operating temperature.

- Observe the temperature display to make sure that the proper operating temperature has been reached.

Step 2: Depress and hold down the READ pushbutton for 10 seconds.

- Make sure the SET pushbutton is released when READ is depressed.
- Make sure that "888" does not appear on the digital display when READ is depressed. If "888" does appear, do *not* administer the test until the battery is replaced.
- Make sure the display continuously shows "–.00" with a flashing minus sign while READ is held down.

Note: If "–.00" with a flashing minus sign does not appear continuously with READ held down, residual alcohol from the previous test may still be present. Depress the SET pushbutton again and return the instrument to your pocket for several minutes. Then if "–.00" with a flashing minus sign does not stay on with READ depressed, you must not administer the test until zero has been adjusted.

Step 3: After you have made a valid zero check, depress the SET pushbutton and install a fresh mouthpiece on the breath intake port.

Step 4: Tell the suspect that he or she must blow hard and steadily, with lips on the mouthpiece. Hold the instrument toward the suspect, vertically.

Step 5: Tell the suspect to start blowing and to continue to blow until you say to stop.

- Watch the suspect and listen for the sound of air rushing through the mouthpiece to make sure he or she is providing a valid breath sample.
- Keep your thumb poised above the READ pushbutton in preparation for taking the sample.
- Watch for signs that the suspect is about to run out of breath.

Step 6: Just before the suspect runs out of breath, depress the READ pushbutton momentarily and tell him or her to stop blowing.

- Remove and discard the mouthpiece.
- Wait 10 seconds to allow the fuel cell to absorb alcohol from the breath sample.

Step 7: Depress and hold down the READ pushbutton continuously.

- Observe the digital display; the numbers appearing there may change during the next 30 to 60 seconds.
- The test result is the final number that appears after the display stops changing.

Step 8: Record the test result and depress the SET pushbutton to clear the fuel cell.

Inspection, Adjustment and Calibration

The main inspection tasks are to check the battery, the temperature display and the SET and READ pushbuttons.

Check the battery status by depressing the READ pushbutton; observe the digital display—if "888" appears, replace the battery.

Battery replacement procedures are as follows:

- Mark the new battery with the replacement date.
- Slide the battery panel door open.
- Remove the old battery.
- Observe the polarity markings on the panel door.
- Insert a new battery with the proper polarity.
- Close the battery panel door.
- Mark or discard the old battery.
- Depress the READ pushbutton and observe the digital display to make sure that the new battery is properly installed.

Check the temperature display by placing the Alco-Sensor II in a controlled temperature environment. After 20 minutes the display should show the temperature of the controlled environment.

Check the operation of the SET and READ pushbuttons as follows:

- SET should stay in the "down" position when it is depressed.
- SET should release when READ is depressed.

Check the Alco-Sensor II zero setting as follows:

- Depress the SET pushbutton.
- Keep the instrument at the proper operating temperature for at least 10 minutes.
- Depress and hold down the READ pushbutton for 10 seconds.
- Observe the digital display: It should show "– .00" with a flashing minus sign symbol.
- If "– .00" with a flashing minus sign does not stay on for the full 10 seconds, zero adjustment is needed.

Adjust the zero setting as follows:

- Depress and hold down the READ pushbutton continuously during the adjustment process.
- Wait 10 seconds after depressing READ.
- Turn the zero adjustment screw *clockwise* until "– .00" appears *without* the minus sign flashing.
- Turn screw *counterclockwise* until "– .00" appears with the minus sign flashing.

After completing the above steps, recheck the zero setting:

- Depress the SET pushbutton and wait 20 seconds.
- Depress and hold down the READ pushbutton for 10 seconds and make sure that "– .00" with the flashing minus sign stays on continuously.

Calibration is the process of ensuring that the instrument produces an accurate BAC measurement.

Calibration requires use of a *breath alcohol simulator.* The simulator is an instrument that contains an alcohol-gas mixture that approximates ("simulates") the breath of a person having a particular BAC.

Calibration procedures are as follows:

Step 1: Make sure the Alco-Sensor II has not been used for 2 hours (or has been used for fewer than five tests during the past hour).

Step 2: Depress the SET pushbutton and keep the instrument at the proper operating temperature for at least 15 minutes.

Step 3: Depress and hold down the READ pushbutton for 10 seconds to check zero. Then, depress the SET pushbutton again.

Step 4: Connect the simulator to the breath intake port.

Step 5: Deliver the simulator gas into the breath intake port; allow the flow to continue for several seconds.

Step 6: While the simulator gas is flowing, momentarily depress the READ pushbutton; then cease simulator flow and disconnect the simulator from the Alco-Sensor II.

Step 7: Wait 10 seconds, then depress and hold down the READ pushbutton continuously; observe the digital display until the test result stabilizes.

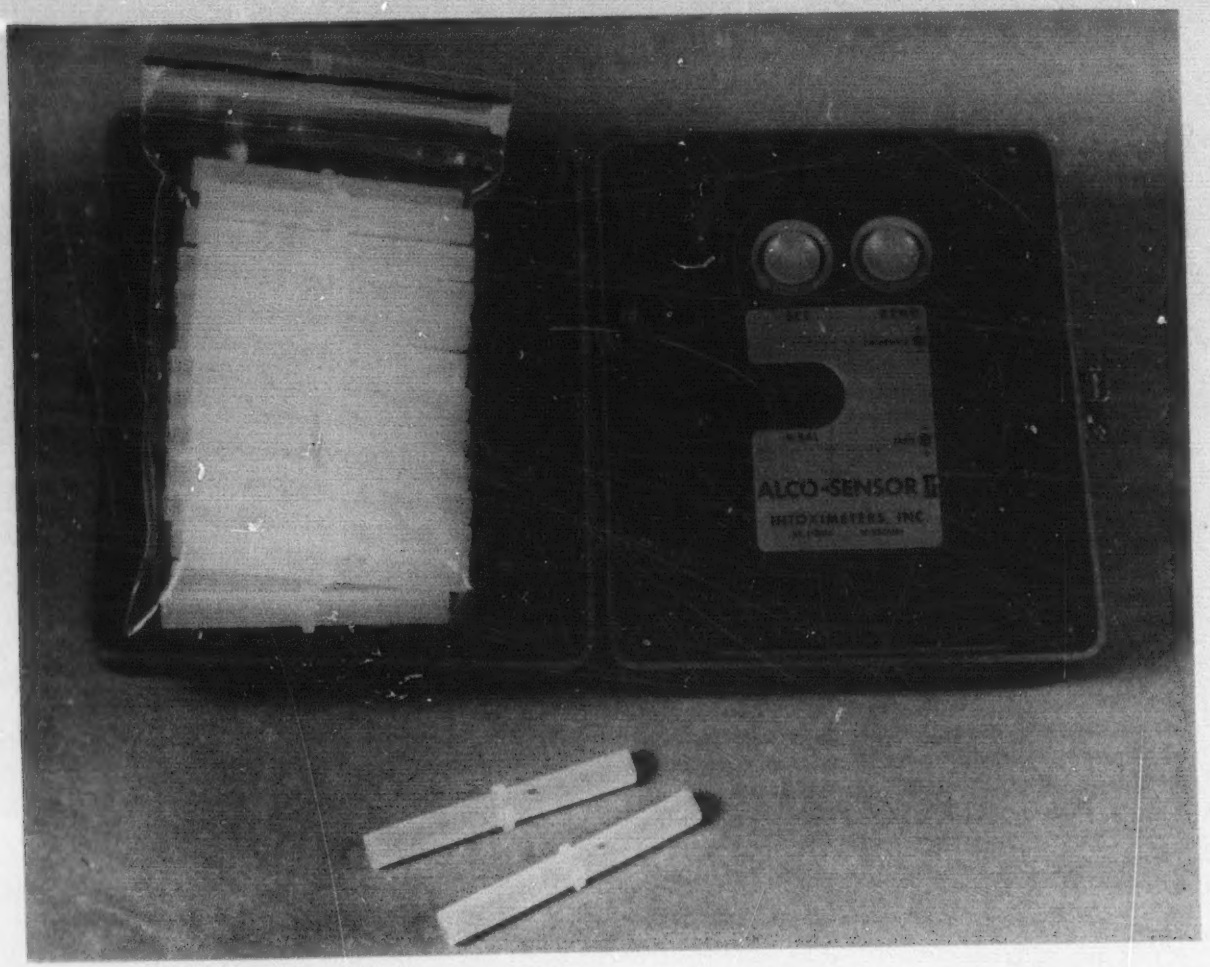
Step 8: Compare the test result with the known BAC value of the simulator. If the figures agree, no adjustment is needed. If they do *not* agree, calibration must be adjusted.

Adjust the calibration as follows:

- Turn the calibration adjustment screw clockwise three full turns.
- Repeat steps 3 through 7 listed above.
- The test result now should be *higher* than the simulator's BAC value. If it is not, turn the calibration adjustment screw three more turns *clockwise* and again repeat steps 3 through 7. Continue, if necessary, until the test result is higher than the simulator's BAC value.
- From this point on, *do not turn the calibration adjustment screw clockwise.*
- Keep the READ pushbutton depressed continuously.
- Turn the calibration adjustment screw *counterclockwise* until the correct BAC value is just displayed; that is, just as the next higher number turns off.
- Continue to observe the digital display. If the test result increases in value, again turn the calibration adjustment screw *counterclockwise* to bring back the correct BAC value. Repeat as necessary until display stays at the correct value.

Study Topics

1. Familiarize yourself thoroughly with the contents of this unit, and especially with Alco-Sensor II operating procedures.
2. Be prepared to answer the following questions:
   a. How do we ensure that we obtain a good deep-lung breath sample from a suspect with the Alco-Sensor II?
   b. What is the function of the SET pushbutton?
   c. Suppose a reading of .12 appears on the digital display 15 seconds after the READ pushbutton is depressed after a test. Is it then necessary to continue to hold the READ pushbutton down until the display stabilizes? Why or why not?
   d. Approximately how many tests can the Alco-Sensor II complete before its battery needs replacement? How many before its fuel cell needs replacement?
   e. What should you do if the suspect stops blowing before you depress the READ pushbutton?
   f. What are the basic operating procedures for the Alco-Sensor II?



Alco-Sensor II

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